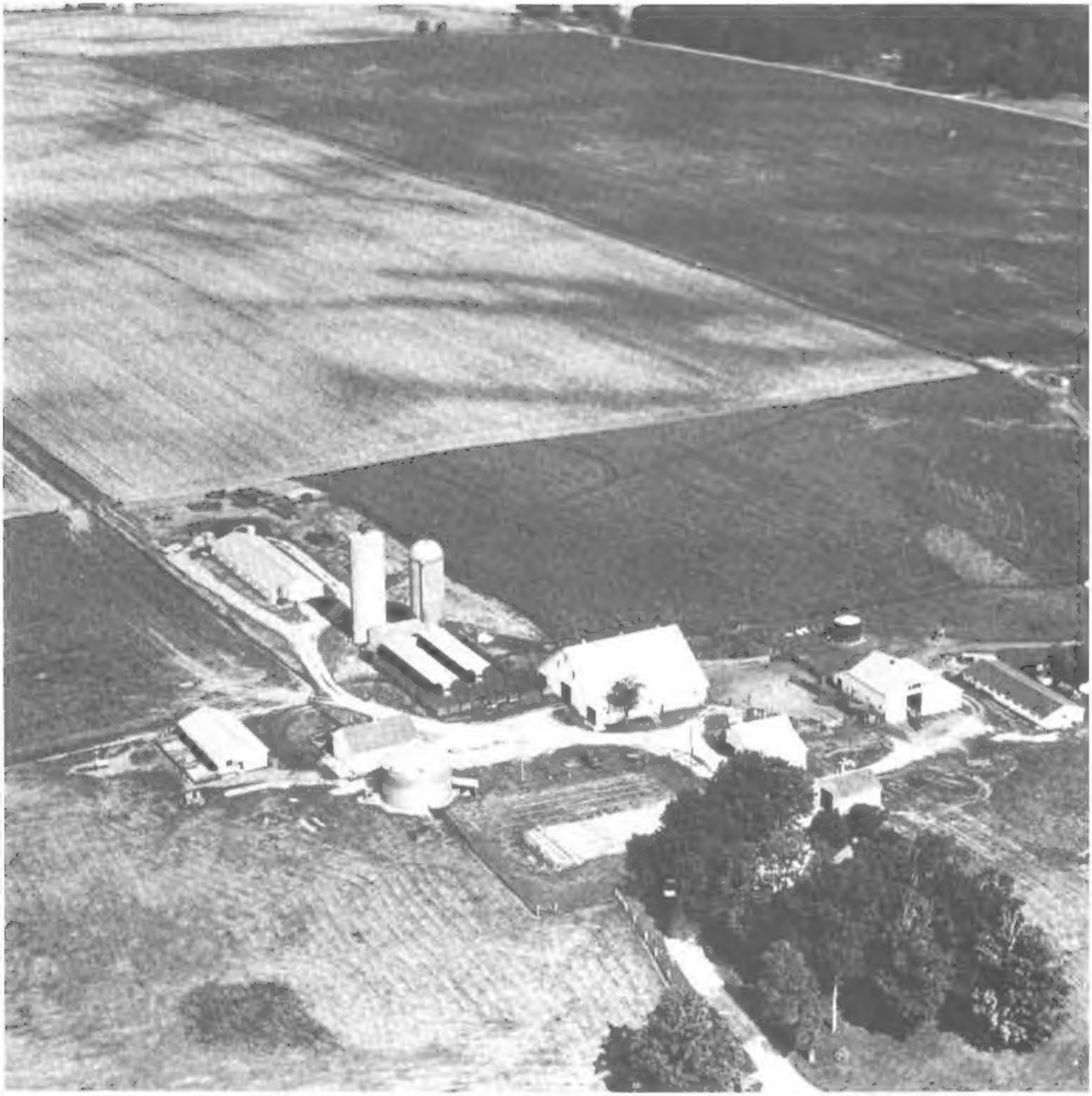
United States
Department of
Agriculture

Soil
Conservation
Service

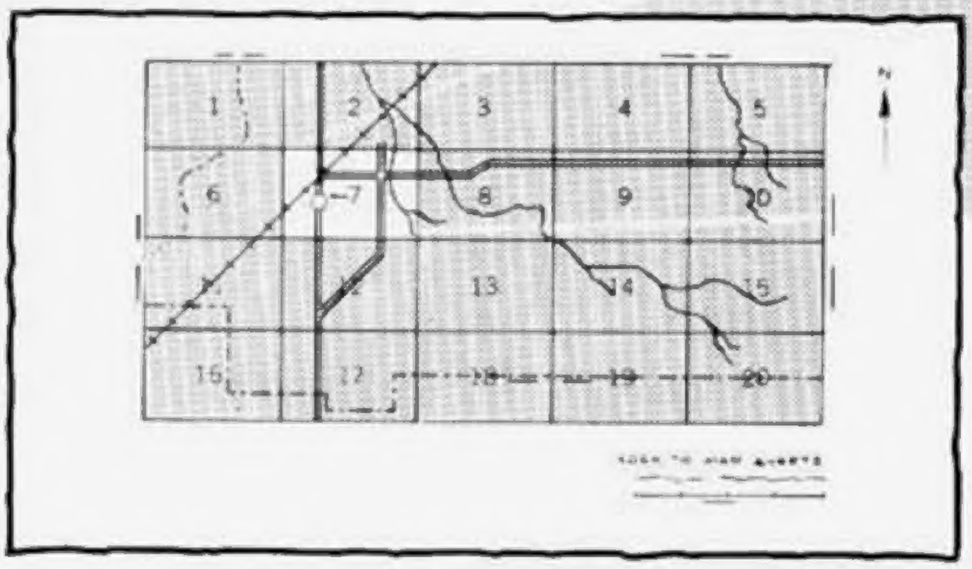
In Cooperation with
Purdue University
Agricultural Experiment
Station and
Indiana Department of
Natural Resources,
Soil and Water
Conservation Committee

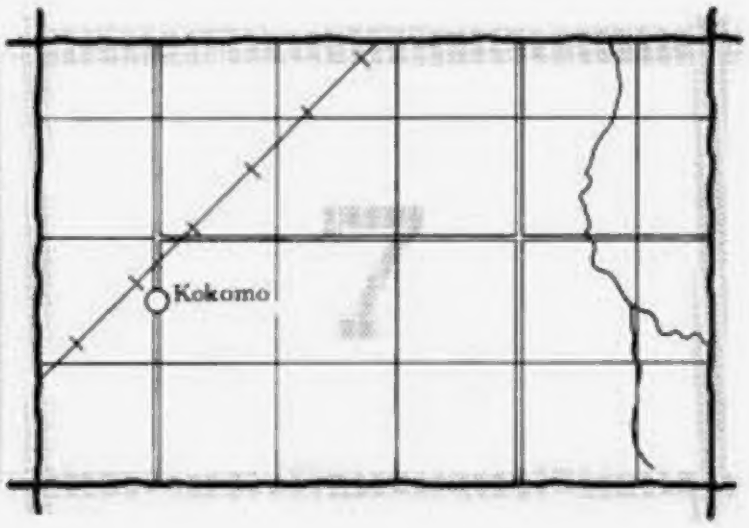
Soil Survey of Decatur County Indiana



HOW TO USE

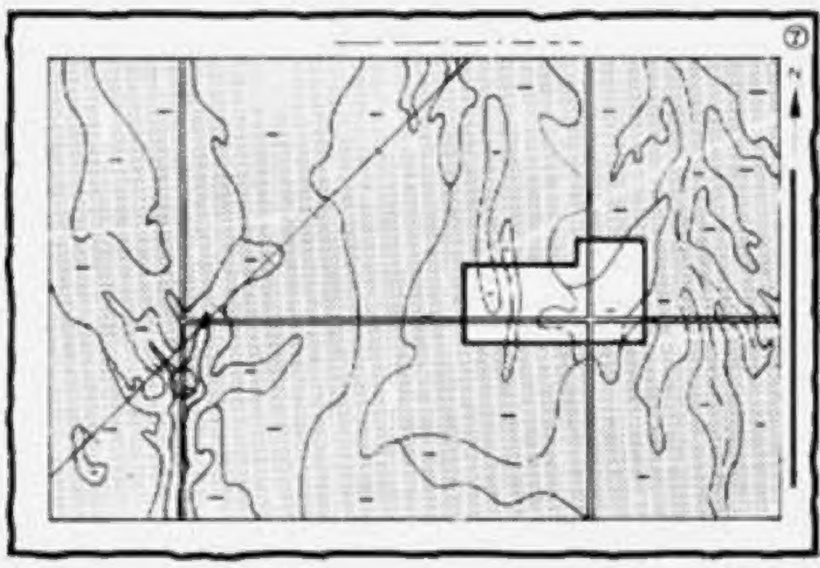
1. Locate your area of interest on the "Index to Map Sheets" (the last page of this publication).

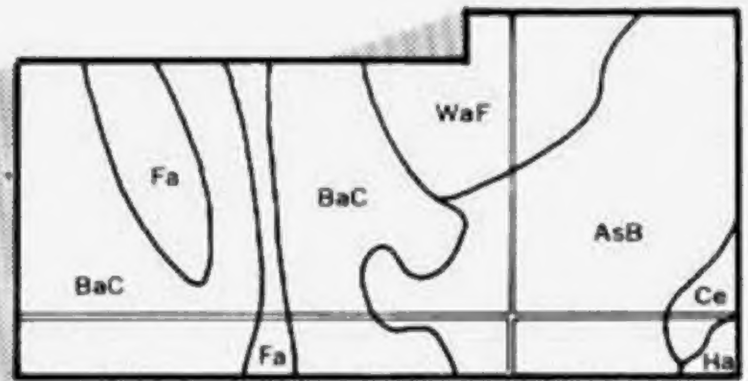




2. Note the number of the map sheet and turn to that sheet.

3. Locate your area of interest on the map sheet.





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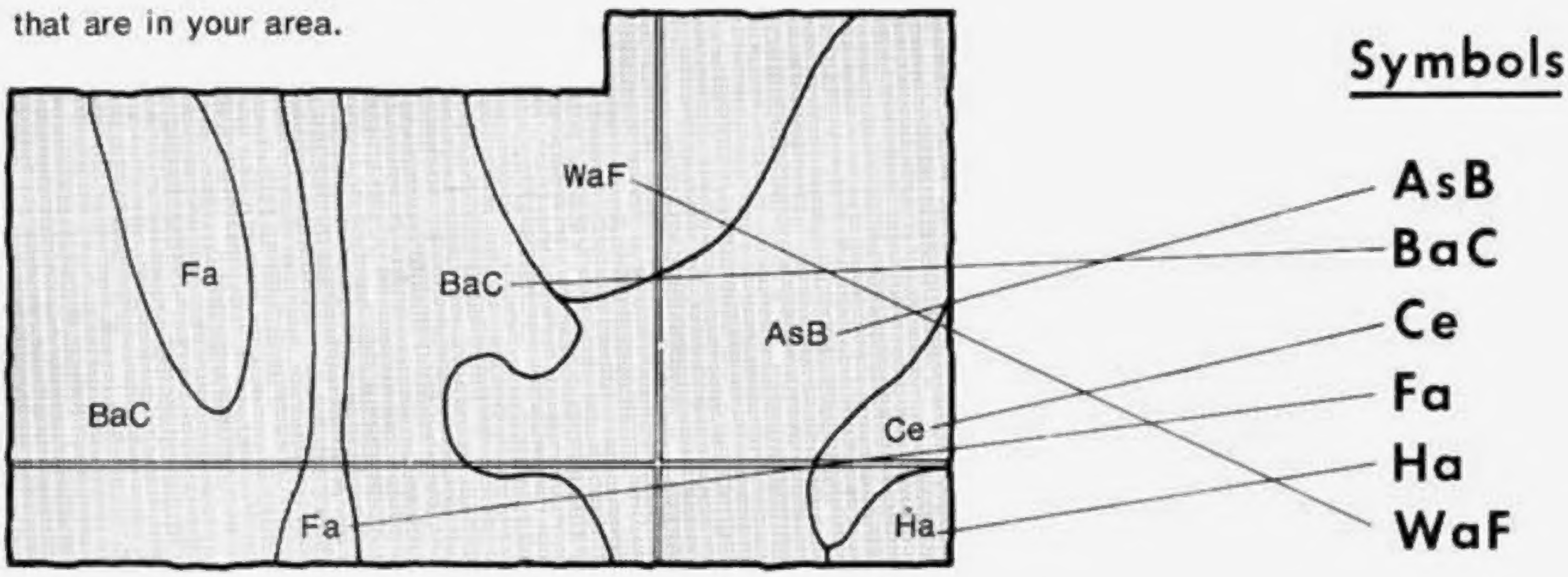
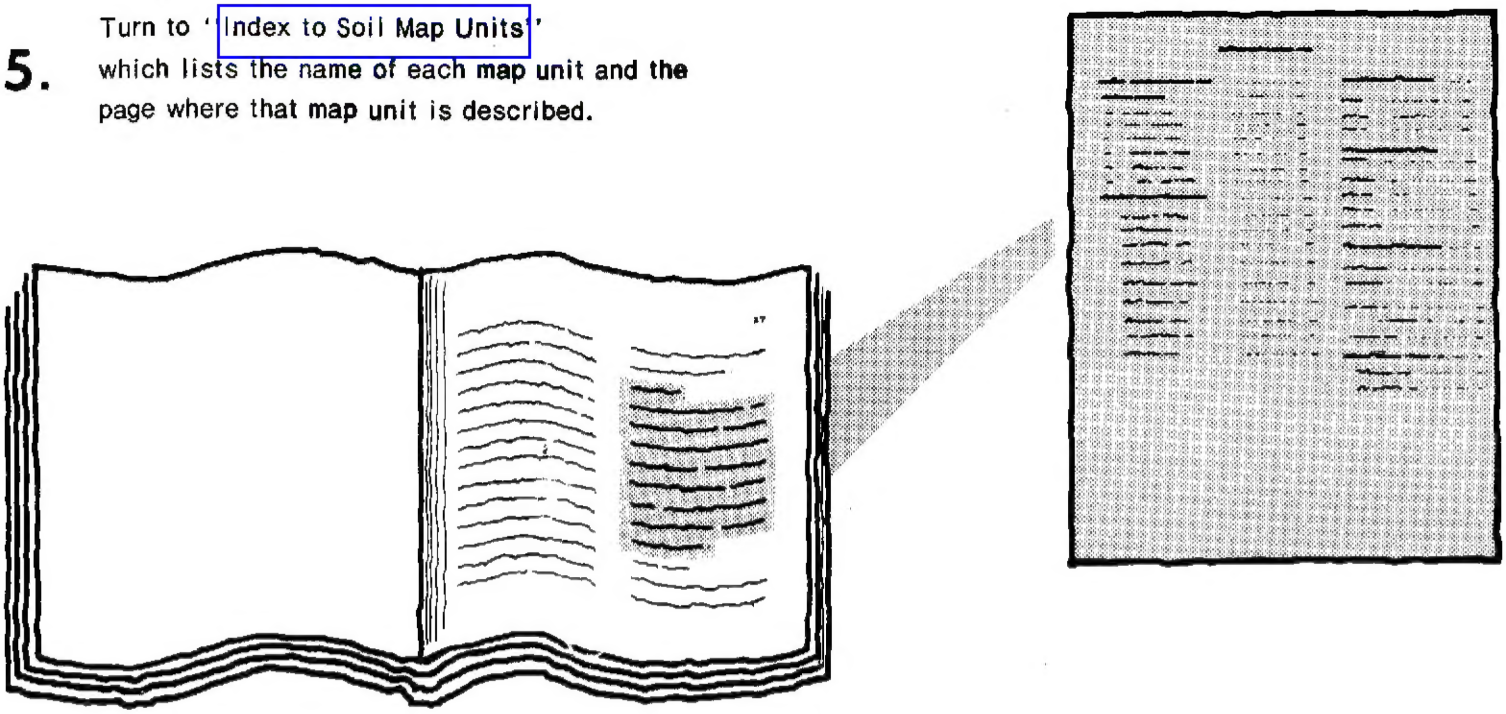
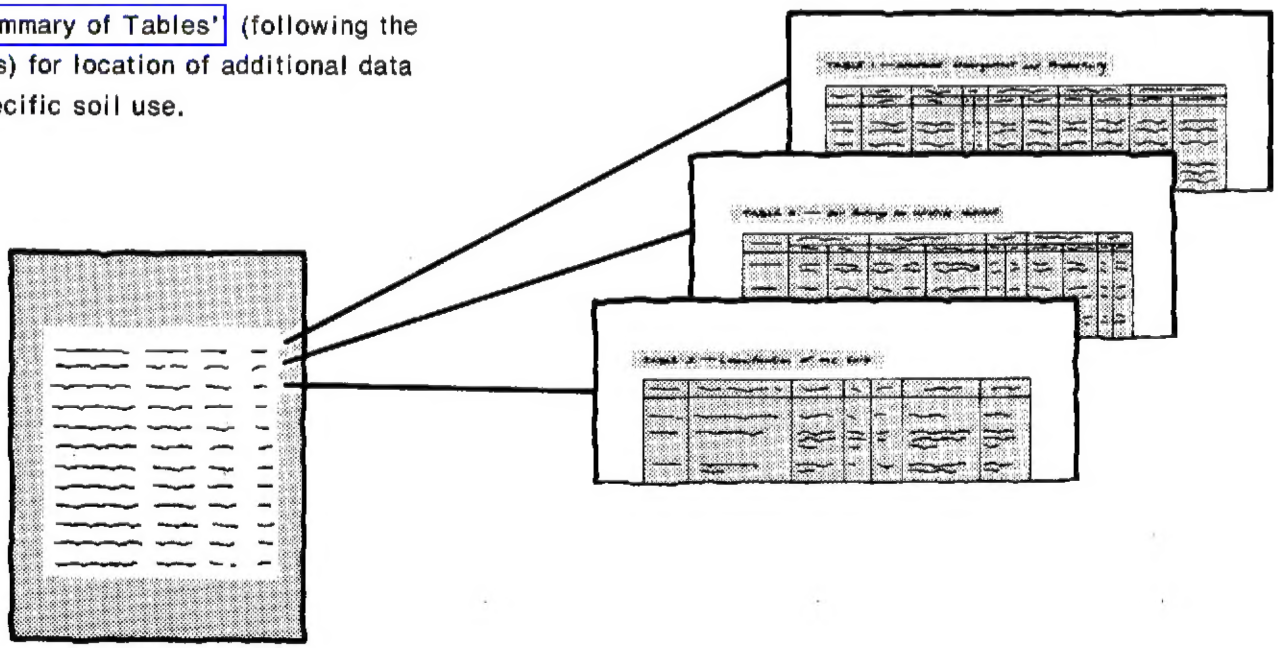


THIS SOIL SURVEY

5. Turn to "Index to Soil Map Units" which lists the name of each map unit and the page where that map unit is described.



6. See "Summary of Tables" (following the Contents) for location of additional data on a specific soil use.



7. Consult "Contents" for parts of the publication that will meet your specific needs. This survey contains useful information for farmers or ranchers, foresters or agronomists; for planners, community decision makers, engineers, developers, builders, or homebuyers; for conservationists, recreationists, teachers, or students; to specialists in wildlife management, waste disposal, or pollution control.

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other federal agencies, state agencies including the Agricultural Experiment Stations, and local agencies. The Soil Conservation Service has leadership for the federal part of the National Cooperative Soil Survey. In line with Department of Agriculture policies, benefits of this program are available to all, regardless of race, color, national origin, sex, religion, marital status, or age.

This survey was made cooperatively by the Soil Conservation Service, the Purdue University Agricultural Experiment Station, and the Indiana Department of Natural Resources, Soil and Water Conservation Committee. It is part of the technical assistance furnished to the Decatur County Soil and Water Conservation District and the Area Planning Commission. Financial assistance was made available by Decatur County Commissioners and approved by the County Council. Major fieldwork was performed in the period 1976-79. Soil names and descriptions were approved in 1979. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1979.

Soil maps in this survey may be copied without permission. Enlargement of these maps, however, could cause misunderstanding of the detail of mapping. If enlarged, maps do not show the small areas of contrasting soils that could have been shown at a larger scale.

Cover. An area of light colored Fincastle and dark colored Cyclone soils used for corn and soybeans.

contents

soil series

Issued January 1983

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summary of tables

foreword

This soil survey contains information that can be used in land-planning programs in Decatur County, Indiana. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations inherent in the soil or hazards that adversely affect the soil, improvements needed to overcome the limitations or reduce the hazards, and the impact of selected land uses on the environment.

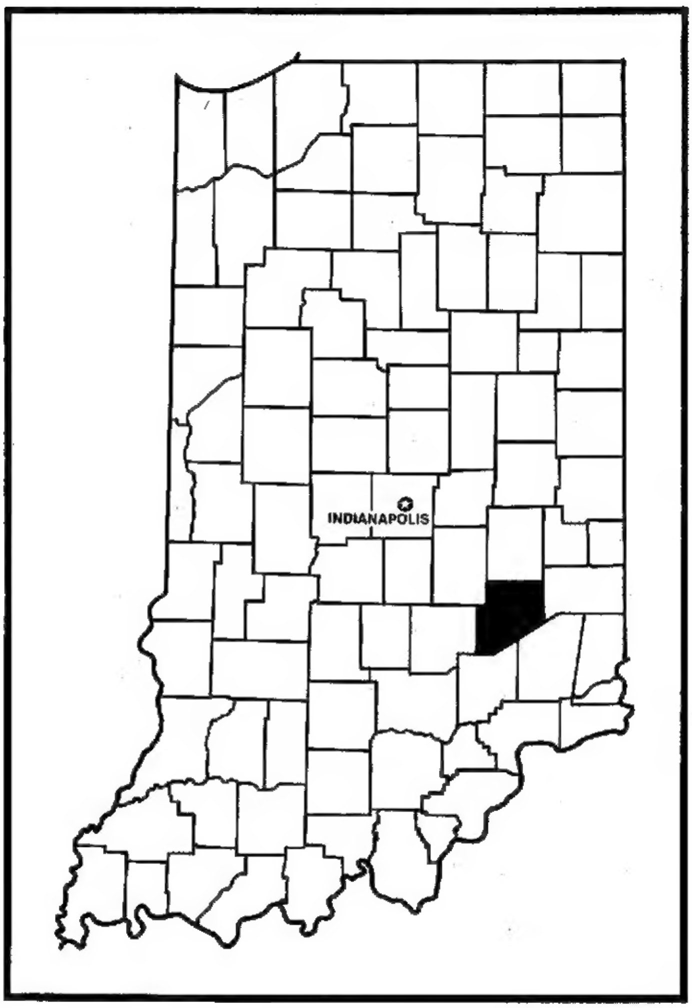
This soil survey is designed for many different users. Farmers, foresters, and agronomists can use it to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land use, select sites for construction, and identify special practices needed to insure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the survey to help them understand, protect, and enhance the environment.

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are shallow to bedrock. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map. The location of each soil is shown on the detailed soil maps. Each soil in the survey area is described. Information on specific uses is given for each soil. Help in using this publication and additional information are available at the local office of the Soil Conservation Service or the Cooperative Extension Service.

Robert L Eddleman

Robert L. Eddleman
State Conservationist
Soil Conservation Service



Location of Decatur County in Indiana.

soil survey of
Decatur County, Indiana

By Jerold L. Shively, Soil Conservation Service

Fieldwork by Jerold L. Shively, Soil Conservation Service, and
Gregory L. Henderson, Soil and Water Conservation Committee,
Indiana Department of Natural Resources

United States Department of Agriculture, Soil Conservation Service,
in cooperation with Purdue University Agricultural Experiment Station
and Indiana Department of Natural Resources,
Soil and Water Conservation Committee

DECATUR COUNTY is about 50 miles southeast of the geographical center of Indiana. It has an area of 236,800 acres, or 370 square miles. Greensburg, the county seat, is near the center of the county. The major towns are Greensburg, Westport, and St. Paul. Decatur County was organized in 1822 from land ceded by the Delaware Indians to the United States in 1819 by the Treaty of St. Marys.

In 1976, Decatur County had a population of about 24,000. In 1980, it had a population of about 26,000 and a population density of 70 people per square mile. The population is expected to increase at the rate of about 14.5 percent per decade, reaching about 34,000 by the year 2000. About 4 percent of the county is urban and built-up land. Additional land will be urbanized as the population increases.

This soil survey updates the soil survey of Decatur County published in 1922 (*3*). It provides additional information and larger maps, which show the soils in greater detail.

general nature of the county

This section gives information about the general features that affect soil use in Decatur County.

natural resources

Besides farmland, natural resources include mineable limestone, sand and gravel, and natural gas. Limestone is close to the surface in some areas, dominantly in those near New Point, Harris City, and St. Paul. Sand and gravel deposits are beneath the surface on outwash terraces. They are available in areas near St. Omer and Downeyville. Natural gas is in many areas throughout the county. Each well produces about enough gas for one household.

relief

Elevation ranges from about 700 feet above sea level south of Westport to 1,093 feet above sea level between Kingston and St. Maurice in the northeastern part of the county. The difference in elevation of about 400 feet is indiscernible because the swells and swales are so conspicuous.

In the northeastern corner of the county, the till plain tends to be hummocky. In the south and east it generally is smoother and is unaffected by stream dissection. Along the streams, the slopes are gently undulating to very steep and vertical limestone bedrock is exposed. The nearly level and gently sloping soils in the county are on till plains dissected by numerous drainageways. The majority of the streams flow southwest. The primary drainageways are the Flatrock River, Clifty Creek, Fall Fork, Wyaloosing Creek, Sand Creek, Salt Creek, Cobbs

Fork, Panther Creek, and Vernon Fork Muscatatuck River. Salt Creek drains the eastern row of townships and flows east.

The county was completely covered by the Illinoian glacier. Later, the Wisconsin glacier covered the northwestern two-thirds of the county. These glaciers smoothed over and filled in the features that were eroded. As a result, most of the previously exposed bedrock is now at a depth of 0 to 200 feet.

water

Wells are the main source of water in Decatur county. They provide a limited supply of good water. Most wells in the county extend into limestone bedrock, which is less than 200 feet below the surface. Several of these deep wells, located along the Flatrock River southeast of St. Omer, provide the water for Greensburg. Limited success in developing new wells indicates that an alternate future water supply may be needed to supplement the wells.

transportation facilities

About 37 percent of the roads in Decatur County are paved, and the rest are surfaced with local crushed stone. Interstate 74 runs east and northwest through the county. U.S. Highway 421 runs southeast and northwest, State Highway 3 north and south, and State Highway 46 east and west. Conrail provides rail transportation. It transverses the county from east to northwest and runs through Greensburg. Numerous small private aircraft landing fields are in the county.

farming

Farming is the major source of income in Decatur County. In 1974, the county had about 1,000 farms, which averaged about 200 acres in size. The number of farms has been slowly decreasing while the size has been slowly increasing. About 96 percent of the total acreage is used for farming, of which 72 percent is cropland. Slightly more than half of the cropland is used for corn, and about one-third is used for soybeans. About 7 percent of the cropland is planted to wheat each year. Also grown are seed corn and seed soybeans, small grain and hay, and a few orchard crops. Some timber is harvested each year.

Income from the sale of livestock and related products is nearly equal to the income from the sale of crops. Locally grown feed is fed almost exclusively to livestock. Hogs are the main livestock raised, followed by beef cattle, dairy cattle, and poultry. A few horses and sheep are also raised.

manufacturing and services for farming

Manufacturing and related services provide jobs for about 2,200 people in the county. Most of these jobs were created within the last two decades. Large-scale manufacturing includes the production of industrial and automotive bearings, custom hydraulic lifting devices, plumbing fixtures, and food packaging materials. Local specialty manufacturing includes the production of log splitters, poultry dressing equipment, infrared drying ovens, and wooden pallets.

climate

Prepared by the National Climatic Center, Asheville, North Carolina.

Table 1 gives data on temperature and precipitation for the survey area as recorded at Greensburg, Indiana, in the period 1951 to 1976. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on length of the growing season.

In winter the average temperature is 31 degrees F, and the average daily minimum temperature is 21 degrees. The lowest temperature on record, which occurred at Greensburg, Indiana, on February 2, 1951, is -35 degrees. In summer the average temperature is 72 degrees, and the average daily maximum temperature is 84 degrees. The highest recorded temperature, which occurred on July 14, 1954, is 105 degrees.

Growing degree days are shown in table 1. They are equivalent to "heat units." During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (40 degrees F). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

The total annual precipitation is about 40 inches. Of this, 23 inches, or about 60 percent, usually falls in April through September, which includes the growing season for most crops. In 2 years out of 10, the rainfall in April through September is less than 18 inches. The heaviest 1-day rainfall during the period of record was 4.60 inches on January 21, 1959. Thunderstorms occur on about 50 days each year, and most occur in the summer.

Average seasonal snowfall is about 17 inches. The greatest snow depth at any one time during the period of record was 11 inches. On an average of 11 days, at least 1 inch of snow is on the ground. The number of such days varies greatly from year to year.

The average relative humidity in midafternoon is about 60 percent. Humidity is higher at night, and the average at dawn is about 80 percent. The sun shines 70 percent of the time possible in summer and 40 percent in winter. The prevailing wind is from the southwest. Average windspeed is highest, 11 miles per hour, in the spring.

how this survey was made

Soil scientists made this survey to learn what soils are in the survey area, where they are, and how they can be used. They observed the steepness, length, and shape of slopes; the size of streams and the general pattern of drainage; the kinds of native plants or crops; and the kinds of rock. They dug many holes to study soil profiles. A profile is the sequence of natural layers, or horizons, in a soil. It extends from the surface down into the parent material, which has been changed very little by leaching or by plant roots.

The soil scientists recorded the characteristics of the profiles they studied and compared those profiles with others in nearby counties and in more distant places. They classified and named the soils according to nationwide uniform procedures. They drew the boundaries of the soils on aerial photographs. These photographs show trees, buildings, fields, roads, and other details that help in drawing boundaries accurately. The soil maps at the back of this publication were prepared from aerial photographs.

The areas shown on a soil map are called map units. Most map units are made up of one kind of soil. Some are made up of two or more kinds. The map units in this survey area are described under "General soil map units" and "Detailed soil map units."

While a soil survey is in progress, samples of some soils are taken for laboratory measurements and for engineering tests. All soils are field tested to determine their characteristics. Interpretations of those characteristics may be modified during the survey. Data are assembled from other sources, such as test results, records, field experience, and state and local specialists. For example, data on crop yields under defined management are assembled from farm records and from field or plot experiments on the same kinds of soil.

But only part of a soil survey is done when the soils have been named, described, interpreted, and delineated on aerial photographs and when the laboratory data and other data have been assembled. The mass of detailed information then needs to be organized so that it can be used by farmers, woodland managers, engineers, planners, developers and builders, home buyers, and others.

general soil map units

The general soil map at the back of this publication shows broad areas that have a distinctive pattern of soils, relief, and drainage. Each map unit on the general soil map is a unique natural landscape. Typically, a map unit consists of one or more major soils and some minor soils. It is named for the major soils. The soils making up one unit can occur in other units but in a different pattern.

The general soil map can be used to compare the suitability of large areas for general land uses. Areas of suitable soils can be identified on the map. Likewise, areas where the soils are not suitable can be identified.

Because of its small scale, the map is not suitable for planning the management of a farm or field or for selecting a site for a road or building or other structure. The soils in any one map unit differ from place to place in slope, depth, drainage, and other characteristics that affect management.

The soils in the survey area vary widely in their potential for major land uses. Table 4 shows the extent of the map units shown on the general soil map. It lists the potential of each, in relation to that of the other map units, for major land uses and shows soil properties that limit use. Soil potential ratings are based on the practices commonly used in the survey area to overcome soil limitations. These ratings reflect the ease of overcoming the limitations. They also reflect the problems that will persist even if such practices are used.

Each map unit is rated for *cultivated crops, woodland,* and *urban uses.* Cultivated crops are those grown extensively in the survey area. Woodland refers to areas of native or introduced trees. Urban uses include residential, commercial, and industrial developments.

soil descriptions

1. Chagrin-Lobdell-Orrville

Nearly level, well drained to somewhat poorly drained soils formed in alluvium on flood plains

This map unit is on bottom land characterized by low lying old stream channels, interfluvial areas, and small stream valleys. It makes up about 5 percent of the county. It is about 41 percent Chagrin soils, 26 percent Lobdell soils, 20 percent Orville soils, and 13 percent soils of minor extent.

The well drained Chagrin soils are on swells on the alluvial bottoms near the channels of the larger stream valleys and in alluvial areas along some of the smaller streams. In a typical profile, the surface layer is brown loam about 8 inches thick. The subsoil is brown, friable loam about 32 inches thick. The substratum to a depth of 60 inches is brown loam.

The moderately well drained Lobdell soils are in interfluvial areas of the larger stream valleys and in the alluvial areas along the smaller streams. In a typical profile, the surface layer is dark brown silt loam about 8 inches thick. The subsoil is about 32 inches thick. The upper part is brown, friable silt loam, and the lower part is brown, mottled, friable loam. The substratum to a depth of 60 inches is yellowish brown, mottled fine sandy loam.

The somewhat poorly drained Orrville soils are in old stream channels of the larger stream valleys and on alluvial bottoms along some small meandering streams. In a typical profile, the surface soil is dark grayish brown silt loam about 10 inches thick. The subsoil is brown yellowish brown, and light brownish gray, mottled, firm silt loam about 30 inches thick. The substratum to a depth of 60 inches is yellowish brown, mottled loam.

Minor in this unit are the well drained Stonelick soils on swells adjacent to the channels in the larger stream valleys; the very poorly drained Sloan soils in alluvial depressions adjacent to the uplands and terraces along the larger stream valleys and in depressions in the smaller stream valleys; and the well drained Martinsville soils on local stream terraces, which are 1 to 6 feet higher than the level of the flood plain. The Udorthents-Pits complex, which consists of sand and gravel pits, is in a few areas.

This unit is used mainly for cultivated crops. Some areas are pastured. A few swampy areas are woodland. Wetness is the major limitation, and flooding is the major hazard. No areas in this unit are protected from flooding.

This unit has good potential for cultivated crops and woodland. It has poor potential for urban and residential uses because of the severe hazard of flooding and the wetness.

2. Ockley-Martinsville-Fox

Nearly level and gently sloping, well drained soils formed in outwash material on outwash plains, terraces, and kames

This map unit is on outwash plains characterized by elongated swells and swales and in areas along drainageways and adjacent to uplands. It makes up about 2 percent of the county. It is about 32 percent Ockley soils, 24 percent Martinsville soils, 14 percent Fox soils, and 30 percent soils of minor extent.

The Ockley soils are on outwash plains, terraces, and kames. In a typical profile, the surface layer is brown silt loam about 7 inches thick. The subsoil is about 38 inches thick. It is, in sequence downward, yellowish brown, firm silt loam; dark yellowish brown, firm loam; dark yellowish brown, firm gravelly sandy clay loam; and dark reddish brown, friable gravelly sandy loam. The substratum to a depth of 60 inches is yellowish brown very gravelly coarse sand that has thin lenses of coarse sand.

The Martinsville soils are on outwash plains and kames. In a typical profile, the surface layer is dark brown loam about 7 inches thick. The subsoil is about 63 inches thick. It is yellowish brown. The upper part is firm silty clay loam, the next part is firm clay loam, and the lower part is friable loam. The substratum to a depth of 75 inches is yellowish brown, stratified fine sandy loam.

The Fox soils are on outwash plains, terraces, and kames. In a typical profile, the surface layer is dark grayish brown loam about 10 inches thick. The subsoil is about 20 inches of dark brown, firm gravelly loam and gravelly sandy clay loam. The substratum to a depth of 60 inches is dark brown very gravelly coarse sand.

Minor in this unit are the very poorly drained Montgomery soils in depressions on outwash terraces; the excessively drained, very steep Rodman soils on breaks between the terraces and outwash plains and on bottom land; the well drained Miami soils in areas adjacent to the uplands where a thin layer of loess overlies glacial till; the somewhat poorly drained Starks soils on loess mantled outwash terraces; and the well drained Chagrin soils in narrow drainageways.

This unit is used mainly for cultivated crops. The Fox soils have a moderate available water capacity and are droughty in most years. The Ockley soils have a high available water capacity and may be droughty in very dry years. Some areas are a good source of sand and gravel.

This unit has good potential for cultivated crops, for woodland, and for urban and residential uses. The major soils generally are the best building sites in Decatur County. The effluent from sanitary facilities, however, may pollute the underground water supplies.

3. Crosby-Cyclone-Miami

Nearly level and gently sloping, somewhat poorly drained, poorly drained, and well drained soils formed in loess and glacial till on uplands

This map unit is on till plains characterized by swells and swales. It makes up about 2 percent of the county. It is about 56 percent Crosby soils, 24 percent Cyclone soils, 11 percent Miami soils, and 9 percent soils of minor extent.

The somewhat poorly drained Crosby soils are on swells and on the perimeter of swales. In a typical profile, the surface layer is dark grayish brown, mottled silt loam about 6 inches thick. The subsurface layer is grayish brown, mottled silt loam about 4 inches thick. The subsoil is about 23 inches thick. The upper part is light brownish gray and grayish brown, mottled, firm clay loam, and the lower part is yellowish brown, mottled, firm clay loam and loam. The substratum to a depth of 60 inches is brown loam.

The poorly drained Cyclone soils are in swales. In a typical profile, the surface layer is very dark grayish brown silt loam about 9 inches thick. The subsurface layer is dark olive gray, mottled silt loam about 7 inches thick. The subsoil is about 44 inches thick. The upper part is very dark gray and brown, mottled, firm silty clay loam and silt loam, and the lower part is yellowish brown, mottled, firm loam. The substratum to a depth of 65 inches is brown loam.

The well drained Miami soils are on the higher knobs or swells and on breaks along drainageways. In a typical profile, the surface layer is brown silt loam about 7 inches thick. The subsoil is about 28 inches thick. The upper part is brown, firm silty clay loam and clay loam, and the lower part is yellowish brown, firm loam. The substratum to a depth of 60 inches is pale brown loam.

Minor in this unit are the moderately well drained Williamstown soils on high knobs; the very poorly drained, moderately deep Millsdale soils in swales; the well drained, moderately deep Milton soils on irregular breaks and swells; and the moderately well drained Lobdell and somewhat poorly drained Orrville soils in drainageways.

This unit is used mainly for cultivated crops. Most areas of the Cyclone soils have been drained adequately by a drainage system. Most other seepy areas also have been drained. Wetness is the main limitation. Ponding is common in winter and spring on the Cyclone soils. Erosion is a hazard in most areas of the Miami soils.

This unit has good potential for cultivated crops and woodland if an adequate drainage system is installed. It has poor potential for most residential and urban uses because the wetness is a severe limitation. A drainage system is needed in areas used for urban development.

4. Fincastle-Cyclone-Xenia

Nearly level and gently sloping, poorly drained to moderately well drained soils formed in loess and glacial till on uplands

This map unit is on till plains characterized by swells and swales (fig. 1). It makes up about 36 percent of the county. It is about 43 percent Fincastle soils, 29 percent Cyclone soils, 13 percent Xenia soils, and 15 percent soils of minor extent (fig. 2).

The somewhat poorly drained Fincastle soils are on broad swells and on the perimeter of swales. In a typical profile, the surface layer is grayish brown silt loam about 8 inches thick. The subsurface layer is grayish brown, mottled silt loam about 2 inches thick. The subsoil is about 44 inches of yellowish brown, mottled, firm silty clay loam and loam. The substratum to a depth of 60 inches is yellowish brown loam.

The poorly drained Cyclone soils are in swales. In a typical profile, the surface layer is very dark grayish brown silt loam about 9 inches thick. The subsurface layer is dark olive gray, mottled silt loam about 7 inches thick. The subsoil is about 44 inches thick. The upper part is very dark gray and brown, mottled, firm silty clay loam and silt loam, and the lower part is brown, mottled, firm loam. The substratum to a depth of 65 inches is brown loam.

Figure 1.—An intensively cropped area of dark colored Cyclone soils and light colored Fincastle soils in the Fincastle-Cyclone-Xenia map unit.

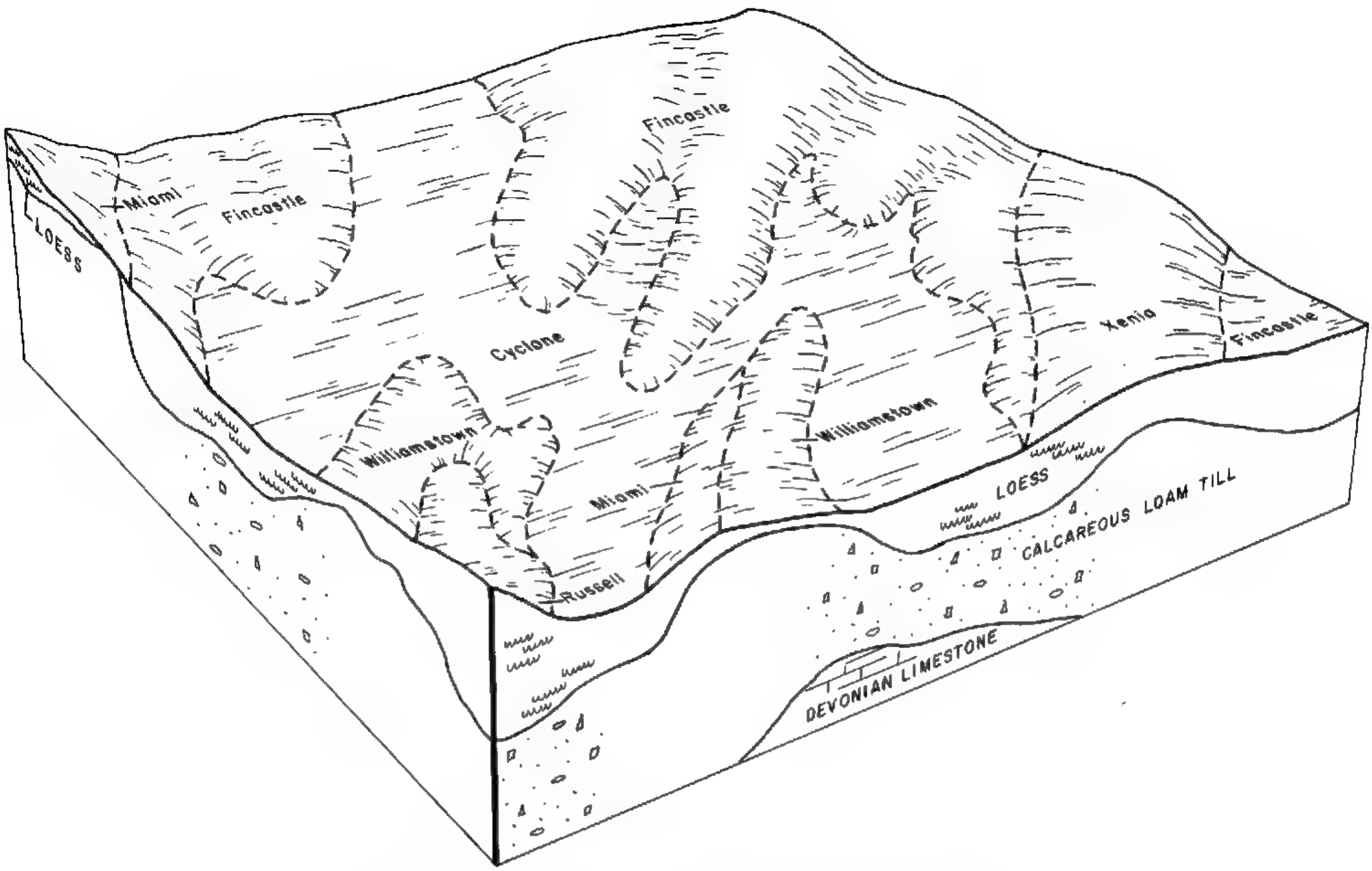


Figure 2.—Pattern of soils in the Fincastle-Cyclone-Xenia map unit.

The moderately well drained Xenia soils are on swells and knobs. In a typical profile, the surface layer is dark brown silt loam about 9 inches thick. The subsoil is about 37 inches thick. The upper part is dark yellowish brown, firm silt loam and silty clay loam, and the lower part is yellowish brown, mottled, firm silty clay loam and clay loam. The substratum to a depth of 60 inches is brown loam.

Minor in this unit are the moderately well drained Williamstown soils on prominent swells and knobs; the well drained Russell soils on the more sloping swells and knobs and on flats; the poorly drained and very poorly drained Milford soils in the deeper depressions within the broad swales; and the well drained Miami soils in a few areas on the higher lying swells.

This unit is used mainly for cultivated crops. Most areas of the Cyclone soils have been adequately drained. Most other seepy areas have also been adequately drained. Wetness is the main limitation. Ponding is common in winter and spring on the Cyclone soils. Erosion is a hazard on the gently sloping Xenia and Fincastle soils.

This unit has good potential for cultivated crops and woodland if an adequate drainage system is installed. It has the best potential in the county for corn and soybeans. It has poor potential for most residential and urban uses because the wetness is a severe limitation. A drainage system is needed in areas used for urban development.

5. Clermont-Avonburg

Nearly level and gently sloping, poorly drained and somewhat poorly drained soils formed in loess and glacial drift on uplands

This map unit is on broad upland glacial till plains that are characterized by weakly expressed swales and swells. It makes up about 13 percent of the county. It is about 51 percent Clermont soils, 46 percent Avonburg soils, and 3 percent soils of minor extent.

The poorly drained Clermont soils are in broad swales. In a typical profile, the surface layer is grayish brown, mottled silt loam about 6 inches thick. The subsurface layer is light gray, mottled silt loam about 13 inches thick. The subsoil to a depth of about 80 inches is mottled silt loam. It is light gray in the upper part and yellowish brown in the lower part. It is firm, and about half of the upper part is brittle. In some areas the soil material below a depth of 30 inches is very firm, brittle silt loam.

The somewhat poorly drained, nearly level and gently sloping Avonburg soils are on broad flats around the perimeter of areas of the Clermont soils and on broad flats and slopes adjacent to small drainageways. In a typical profile, the surface layer is grayish brown silt loam about 7 inches thick. The subsurface layer is light brownish gray, mottled silt loam about 6 inches thick. The subsoil extends to a depth of about 80 inches. It is light brownish gray and yellowish brown, mottled, firm silt loam in the upper part; a fragipan of light brownish gray and yellowish brown, mottled, very firm, brittle silt loam in the next part; and yellowish brown, mottled, firm silt loam in the lower part.

Minor in this unit are the moderately well drained, gently sloping Rossmoyne soils on small flats and on slopes adjacent to small drainageways and the somewhat poorly drained Orrville soils on alluvial bottoms along small, narrow drainageways.

This unit is used mainly for cultivated crops. Some areas have been drained. Some are woodland. A few are pasture. Prolonged wetness is the main limitation. Ponding is common in winter and spring (fig. 3).

Figure 3.—Ponding on the poorly drained Clermont soils in the Clermont-Avonburg map unit. The surface water retards corn growth. The somewhat poorly drained Avonburg soils are in the background.

This unit has only fair potential for cultivated crops and woodland because of the wetness and because establishing a drainage system is difficult. Overcoming the wetness is so difficult that the potential is poor for residential and urban uses.

6. Cincinnati-Rossmoyne-Hickory

Gently sloping to very steep, well drained and moderately well drained soils formed in loess and glacial drift or in glacial till; on uplands

This map unit is on highly dissected till plains (fig. 4). It makes up about 16 percent of the county. It is about 32 percent Cincinnati soils, 30 percent Rossmoyne soils, 13 percent Hickory soils, and 25 percent soils of minor extent (fig. 5).

The well drained, gently sloping and moderately sloping Cincinnati soils are on nose slopes and on side slopes and toe slopes above the drainageways. These soils formed in loess, glacial drift, and glacial till. They are moderately deep to a fragipan, which restricts root penetration and water movement. In a typical profile, the surface layer is about 8 inches of dark brown silt loam mixed with some yellowish brown subsoil material. The subsoil extends to a depth of about 80 inches. It is yellowish brown, firm and very firm silty clay loam in the

Figure 4.—A dissected area of moderately sloping and strongly sloping soils in the Cincinnati-Rossmoyne-Hickory map unit used for pasture.

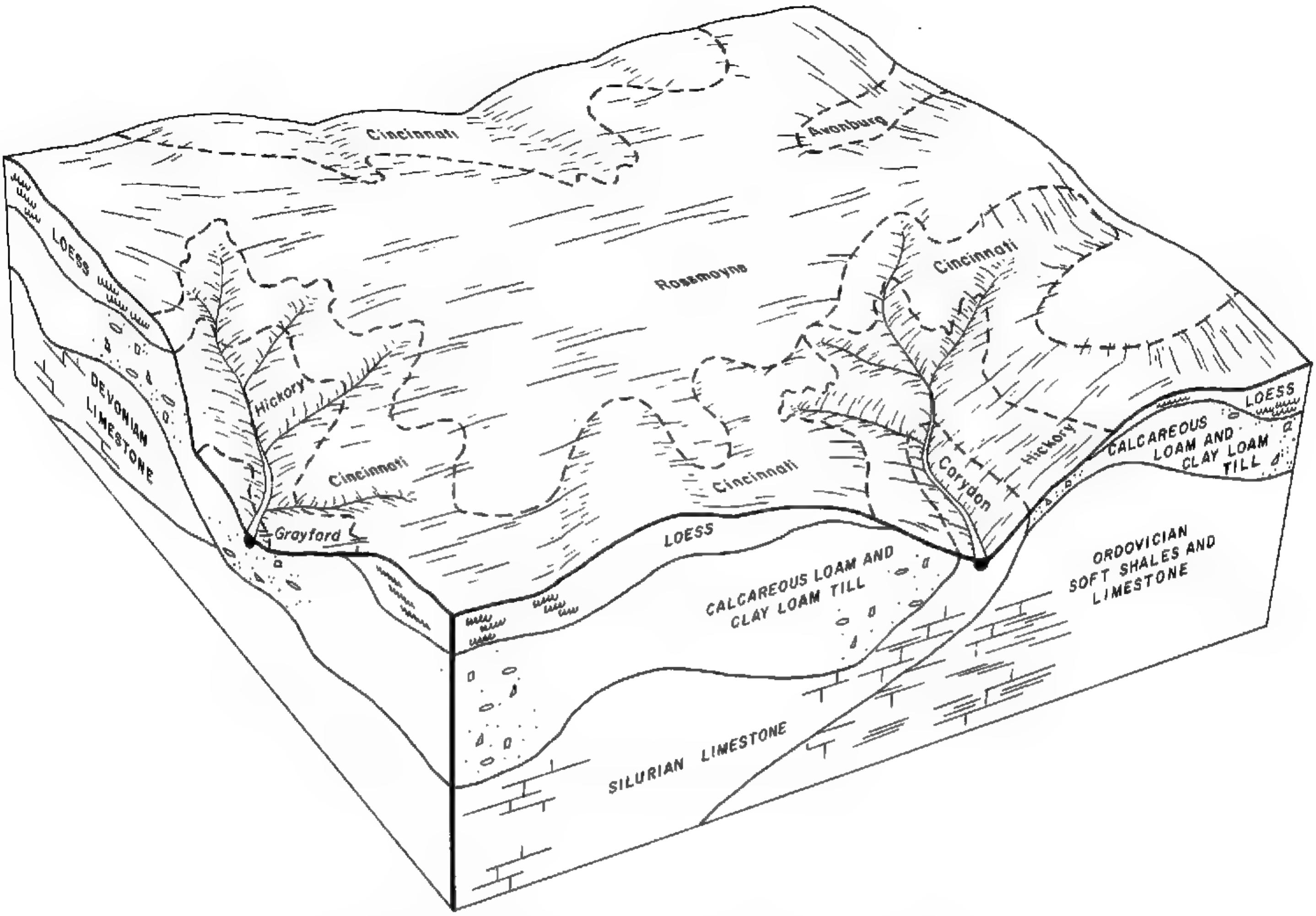


Figure 5.—Pattern of soils in the Cincinnati-Rossmoyne-Hickory map unit.

upper part; a fragipan of yellowish brown and brown, very firm, brittle silty clay loam, loam, and clay in the next part; and brown, firm clay loam in the lower part.

The moderately well drained, gently sloping Rossmoyne soils are on ridgetops above the drainageways. These soils formed in loess, glacial drift, and glacial till. They are moderately deep to a fragipan, which limits root penetration and water movement. In a typical profile, the surface layer is brown silt loam about 7 inches thick. The subsoil extends to a depth of about 80 inches. It is yellowish brown, firm silt loam in the upper part; a fragipan of yellowish brown, mottled, very firm, brittle silt loam in the next part; and yellowish brown, firm loam in the lower part.

The well drained, strongly sloping to very steep Hickory soils are on side slopes and toe slopes above the drainageways. These soils formed in glacial till. In some areas they have a thin loess mantle. Root penetration and water movement are good throughout the soil. In a typical profile, the surface layer is dark brown loam about 5 inches thick. The subsoil is yellowish brown and strong brown, firm clay loam about 47 inches thick. The substratum to a depth of 60 inches is yellowish brown loam.

Minor in this unit are areas of Rock outcrop and the well drained, strongly sloping to steep Corydon soils adjacent to or on vertical limestone bedrock escarpments; the well drained, gently sloping to moderately steep Grayford and Ryker soils on slopes at the higher elevations; the somewhat poorly drained Avonburg soils on the broader ridgetops; and the somewhat poorly drained Orrville and moderately well drained Lobdell soils in small drainageways.

Most of the acreage of this unit is used as woodland, pasture, or hayland. The rest is used mainly for cultivated crops. Erosion is the major hazard. Slope

limits the use of equipment. These soils are susceptible to further erosion because of the slope. Some areas have reverted back to native hardwoods.

The gently sloping soils have good potential and the more sloping soils poor potential for cultivated crops. Erosion is a severe hazard. The unit has good potential for hay, pasture, and woodland. The fragipan in Rossmoyne and Cincinnati soils and the shallow bedrock in Corydon soils restrict root penetration and limit the available water capacity. The potential for most residential and urban uses is poor because of the slope, the fragipan, and the bedrock.

7. Miami-Xenia-Williamstown

Nearly level to strongly sloping, well drained and moderately well drained soils formed in loess and glacial till on uplands

This map unit is on glacial till uplands adjacent to the larger stream valleys on till plains. It is in areas in the northwestern two-thirds of the county. It makes up about 26 percent of the county. It is about 42 percent Miami soils, 14 percent Xenia soils, 12 percent Williamstown soils, and 32 percent soils of minor extent.

The well drained, gently sloping to strongly sloping Miami soils are on ridgetops and side slopes on glacial till uplands. In a typical profile, the surface layer is brown silt loam about 7 inches thick. The subsoil is about 28 inches thick. The upper part is brown, firm silty clay loam and clay loam, and the lower part is yellowish brown, firm loam. The substratum to a depth of 60 inches is pale brown loam.

The moderately well drained, nearly level and gently sloping Xenia and Williamstown soils are on swells and knobs on ridgetops in the glacial till uplands. In a typical profile of Xenia soils, the surface layer is dark brown silt loam about 9 inches thick. The subsoil is about 37 inches thick. The upper part is dark yellowish brown, firm silt loam and silty clay loam, and the lower part is yellowish brown, mottled, firm silty clay loam and clay loam. The substratum to a depth of 60 inches is brown loam. In a typical profile of Williamstown soils, the surface layer is brown silt loam about 9 inches thick. The subsoil is about 28 inches of yellowish brown, mottled, firm clay loam and loam. The substratum to a depth of 60 inches is yellowish brown, mottled loam.

Minor in this unit are the well drained, very steep Hennepin soils on breaks on glacial till uplands adjacent to streams; the well drained, nearly level and gently sloping Russell soils on swells in the glacial till uplands; the well drained Hickory soils on side slopes, principally along Cobbs Fork; the somewhat poorly drained, nearly level Fincastle soils in swales; and the poorly drained Cyclone soils at the head of drainageways.

About one-half of this unit is used for cultivated crops, and the rest is used as woodland, pasture, or hayland. Erosion is the major hazard. It is excessive in the many areas intensively used for cultivated crops. Because of the slope, most areas are susceptible to further erosion. The slope limits the use of equipment in many areas. If cultivation is no longer feasible, the soils are used for hay or pasture or are left to revert back to native hardwoods. Many areas remain wooded.

The less sloping soils have good potential for cultivated crops, but the rest have poor potential because of the slope and the severe hazard of erosion. The unit has good potential for woodland. It has poor potential for most residential and urban uses in the steeper areas and fair or good potential in the less sloping areas.

detailed soil map units

The map units on the detailed soil maps at the back of this survey represent the soils in the survey area. The map unit descriptions in this section, along with the soil maps, can be used to determine the suitability and potential of a soil for specific uses. They also can be used to plan the management needed for those uses. More information on each map unit, or soil, is given under "Use and management of the soils."

Each map unit on the detailed soil maps represents an area on the landscape and consists of one or more soils for which the unit is named.

A symbol identifying the soil precedes the map unit name in the soil descriptions. Each description includes general facts about the soil and identifies the principal hazards and limitations to be considered in planning for specific uses.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer or of the substratum, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer or of the substratum. They also can differ in slope, stoniness, salinity, wetness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Miami silt loam, 2 to 6 percent slopes, eroded, is one of several phases in the Miami series.

Some map units are made up of two or more major soils. These map units are called soil complexes. A *soil complex* consists of two or more soils that occur as areas so intricately mixed or so small that they cannot be shown separately on the soil maps. The pattern and proportion of the soils are somewhat similar in all areas. Grayford-Ryker silt loams, 4 to 10 percent slopes, eroded, is an example.

Most map units include small scattered areas of soils other than those for which the map unit is named. Some of these included soils have properties that differ substantially from those of the major soil or soils. Such differences could significantly affect use and management of the soils in the map unit. These dissimiliar soils are described in each map unit. Also, some of the more unusual or strongly contrasting soils are identified by a special symbol on the soil maps.

This survey includes some *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. The Pits in the Udorthents-Pits complex are an example. Some miscellaneous areas are large enough to be delineated on the soil maps. Some that are too small to be delineated are identified by a special symbol on the soil maps.

Table 5 gives the acreage and proportionate extent of each map unit. Other tables (see "Summary of tables") give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils.

In the descriptions that follow, perimeter drains around septic tank absorption fields are suggested as a means to overcome wetness. They are only experimental, however, as approved by the State Health Department and may not be legal in some areas.

soil descriptions

AvA—Avonburg silt loam, 0 to 2 percent slopes. This nearly level, deep, somewhat poorly drained soil is near the outside edges of large flats and in the middle of the smaller flats on till plains. It has a fragipan. Areas are irregular in shape. They are dominantly about 25 acres in size but range from 3 to 40 acres. Slopes are 100 to 500 feet long.

In a typical profile, the surface layer is grayish brown silt loam about 7 inches thick. The subsurface layer is light brownish gray, mottled silt loam about 6 inches thick. The subsoil to a depth of about 80 inches is silt loam. It is light brownish gray and yellowish brown, mottled, and firm in the upper part; a light brownish gray and yellowish brown, mottled, very firm, brittle fragipan in the next part; and yellowish brown and firm in the lower part.

Included with this soil in mapping are small areas of the poorly drained Clermont soils in slight depressions, areas of the moderately well drained Rossmoyne soils on long, narrow side slopes along drainageways, and small, narrow areas of colluvial soils in drainageways. These soils make up about 13 percent of the unit.

The Avonburg soil is very slowly permeable in the fragipan. It has a seasonal high water table at a depth of 1 to 3 feet. Available water capacity is moderate.

Organic matter content is moderately low in the surface layer. Surface runoff is slow in cultivated areas. The surface layer is dominantly medium acid. It is friable and can be easily tilled throughout a fairly wide range in moisture content. Root penetration is restricted by the fragipan.

Most areas are used for cultivated crops. A few are used for hay, pasture, or woodland.

This soil is suited to corn, soybeans, wheat, and oats. The wetness and the fragipan are the major limitations. If an adequate drainage system is installed, row crops can be grown in most years. A surface drainage system generally is needed to lower the water table. A subsurface drainage system generally works satisfactorily for only a few years. Cover crops and a conservation tillage system that leaves all or part of the crop residue on the surface increase the organic matter content and help to maintain good tilth.

This soil is suited to shallow rooted, water tolerant grasses and legumes for hay and pasture. It is poorly suited, however, to deep rooted legumes because of the very slowly permeable, brittle fragipan, which restricts root penetration. Other concerns of management are overgrazing and grazing during wet periods. Grazing when the soil is wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is suited to trees. Plant competition, the windthrow hazard, and seedling mortality are the main management concerns. The fragipan restricts root penetration. Seedlings survive and grow well if competing vegetation is controlled by spraying, cutting, or girdling. Selecting special planting stock and overstocking help to overcome seedling mortality. Harvesting methods that do not isolate the remaining trees or leave them widely spaced help to prevent windthrow. Excluding livestock helps to prevent deterioration of the woodland. Harvesting mature trees and fostering the growth of seed trees improve the woodland.

The wetness is a severe limitation if this soil is used as a site for buildings. It can be overcome, however, by a drainage system that lowers the seasonal high water table and a foundation drainage system that removes excess water around foundations. Low strength and frost action are severe limitations on sites for local roads and streets. Adequate road ditches help to lower the water table and thus help to prevent the damage caused by frost action. Providing coarse grained subgrade or base material helps to prevent the damage caused by low strength and frost action.

The wetness and the very slow permeability are severe limitations if this soil is used as a septic tank absorption field. Elevating the absorption field on a mound of better suited material helps to overcome these limitations. Perimeter drains around the field help to remove the excess water.

The capability subclass is IIw; woodland suitability subclass 3d.

AvB—Avonburg silt loam, 2 to 4 percent slopes. This gently sloping, deep, somewhat poorly drained soil is on side slopes near drainageways in the uplands. It has a fragipan. Areas are long and irregular in shape and are 3 to 10 acres in size. Slopes are 30 to 120 feet long.

In a typical profile, the surface layer is brown silt loam about 8 inches thick. The subsurface layer is grayish brown, mottled silt loam about 3 inches thick. The subsoil extends to a depth of about 80 inches. It is grayish brown and yellowish brown, mottled, firm silt loam and silty clay loam in the upper part; a fragipan of yellowish brown, gray, and brownish yellow, mottled, very firm, brittle silty clay loam and silt loam in the next part; and yellowish brown, mottled, firm loam in the lower part.

Included with this soil in mapping are areas of the moderately well drained Rossmoyne soils on side slopes along drainageways. These soils make up about 8 percent of the unit. Also included are small, narrow areas of colluvial soils in drainageways. These soils make up about 3 percent of the unit.

The Avonburg soil is very slowly permeable in the fragipan. It has a seasonal high water table at a depth of 1 to 3 feet. Available water capacity is moderate. Organic matter content is moderately low in the surface layer. Surface runoff is medium in cultivated areas. The surface layer is dominantly medium acid. It is friable and can be easily tilled throughout a fairly wide range in moisture content. Root penetration is restricted by the fragipan. The shrink-swell potential is moderate.

Most areas are used for cultivated crops. A few are used for hay, pasture, or woodland.

This soil is suited to corn, soybeans, wheat, and oats. The wetness and the fragipan are the major limitations, and erosion is the major hazard. If an adequate drainage system is installed and erosion is controlled, row crops can be grown in most years. A surface drainage system generally is needed to lower the water table. A subsurface drainage system generally works satisfactorily for only a few years. Measures that control erosion and runoff are needed in cultivated areas. Grassed waterways, a conservation tillage system that leaves all or part of the crop residue on the surface, a cropping sequence that includes grasses and legumes, and cover crops help to control runoff and prevent excessive soil loss, increase the organic matter content, and help to maintain good tilth.

This soil is suited to shallow rooted, water tolerant grasses and legumes for hay and pasture. It is poorly suited, however, to deep rooted legumes because of the very slowly permeable, brittle fragipan, which restricts root penetration. The major concerns of management are overgrazing and grazing during wet periods. Grazing

when the soil is wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is suited to trees. The windthrow hazard and seedling mortality are the main management concerns. The fragipan restricts root penetration. Seedlings survive and grow well if competing vegetation is controlled by spraying, cutting, or girdling. Excluding livestock helps to prevent deterioriation of the woodland. Harvesting mature trees and fostering the growth of seed trees improve the woodland.

The wetness is a severe limitation and the shrink-swell potential a moderate limitation if this soil is used as a site for buildings. Installing an adequate drainage system that lowers the seasonal high water table and a foundation drainage system that removes excess water around foundations helps to overcome the wetness. Backfilling with coarse material helps to prevent the structural damage caused by shrinking and swelling. Low strength and frost action are severe limitations on sites for local roads and streets. Adequate road ditches help to lower the water table and thus help to prevent the damage caused by frost action. Providing coarse grained subgrade or base material helps to prevent the damage caused by low strength and frost action.

The very slow permeability and the wetness are severe limititations if this soil is used as a septic tank absorption field. Elevating the absorption field on a mound of better suited material helps to overcome these limitations. Perimeter drains around the field help to remove the excess water.

The capability subclass is IIe; woodland suitability subclass 3d.

Cg—Chagrin loam, frequently flooded. This nearly level, deep, well drained soil is on broad swells along drainageways on flood plains. It is frequently flooded for very brief periods in the winter and spring. Areas are broad and irregular in shape. They are dominantly about 15 acres in size but range from 3 to 300 acres.

In a typical profile, the surface layer is brown loam about 8 inches thick. The subsoil is brown, friable loam about 32 inches thick. The substratum to a depth of 60 inches is brown loam. In some small areas part of the soil above a depth of 40 inches is calcareous. In other areas very dark grayish brown or very dark gray layers are below a depth of about 3 feet.

Included with this soil in mapping are small areas of the moderately coarse textured Stonelick soils, the moderately well drained Lobdell soils, and the somewhat poorly drained Orrville soils. These soils are on the slightly lower parts of the landscape. They each make up about 5 percent of the unit.

The Chagrin soil is moderately permeable. It has a seasonal high water table at a depth of 4 to 6 feet. Available water capacity is high. Organic matter content is moderately low in the surface layer. Surface runoff is slow. The surface layer is neutral or slightly acid. It is friable and can be easily tilled throughout a wide range in moisture content.

Most areas are used for cultivated crops. A few areas are used for hay or pasture. Some are used as woodland.

This soil is suited to corn and soybeans. Spring and winter flooding is the major hazard. Levees help to protect crops from floodwater. Green manure crops and a conservation tillage system that leaves all or part of the crop residue on the surface increase the organic matter content and help to maintain tilth.

This soil is well suited to grasses and legumes for hay and pasture, but it is subject to flooding. Overgrazing or grazing when the soil is wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is well suited to trees. Plant competition is the main management concern. The competing trees and shrubs can be controlled by site preparation or by spraying, cutting, or girdling. Excluding livestock helps to prevent deterioriation of the woodland. Harvesting mature trees and fostering the growth of seed trees improve the woodland.

This soil is generally unsuitable as a site for buildings, local roads and streets, and septic tank absorption fields. The flooding is the main hazard. Also, frost action is a moderate limitation on sites for local roads and streets. Constructing roads on raised, well compacted fill material and providing adequate side ditches and culverts help to prevent the damage caused by flooding and frost action.

The capability subclass is IIw; woodland suitability subclass 1o.

Ch—Chagrin Variant silt loam, frequently flooded. This nearly level, moderately deep, well drained soil is in slightly convex areas along drainageways on flood plains. It is frequently flooded for very brief periods. Areas are somewhat narrow and irregular in shape. They are dominantly about 15 acres in size but range from 5 to 40 acres.

In a typical profile, the surface layer is dark brown silt loam about 7 inches thick. The subsoil is about 18 inches thick. The upper part is dark brown, friable silt loam, and the lower part is brown, friable loam. Limestone bedrock is at a depth of about 25 inches. In some areas the lower part of the subsoil is grayish brown and is mottled. In places bedrock is at a depth of 8 to 20 inches.

Included with this soil in mapping are small areas of the moderately well drained Lobdell soils and the somewhat poorly drained Orrville soils. These soils are in the slightly lower depressions. They each make up about 7 percent of the unit.

Permeability is moderate in the Chagrin Variant soil, and available water capacity is low. Organic matter content is moderately low in the surface layer. Surface runoff is slow. The surface layer is slightly acid or neutral. It is friable and can be easily tilled throughout a moderate range in moisture content. Root penetration is good throughout the soil but is restricted by the bedrock.

Most areas are used for cultivated crops. Many are used for pasture or hay. Some are used as woodland.

This soil is suited to corn and soybeans. Spring and winter flooding is the major hazard and the low available water capacity a major limitation. Building levees helps to protect crops from floodwater. Green manure crops and a conservation tillage system that leaves all or part of the crop residue on the surface increase the organic matter content and help to maintain tilth.

This soil is well suited to grasses and legumes for hay and pasture, but it is subject to flooding. Overgrazing or grazing when the soil is wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is suited to trees. Plant competition and the windthrow hazard are management concerns. Harvesting methods that do not isolate the remaining trees or leave them widely spaced help to prevent windthrow. The competing trees and shrubs can be controlled by site preparation or by spraying, cutting, or girdling. Excluding livestock helps to prevent deterioration of the woodland. Harvesting mature trees and fostering the growth of seed trees improve the woodland.

This soil is generally unsuitable as a site for buildings, local roads and streets, and septic tank absorption fields. The flooding is the main hazard. Also, the bedrock within a depth of 40 inches is a limitation on sites for dwellings with basements or for septic tank absorption fields and frost action a limitation on sites for local roads and streets. Constructing roads on raised, well compacted fill material and providing adequate side ditches and culverts help to prevent the damage caused by flooding and frost action.

The capability subclass is IIIw; woodland suitability subclass 1d.

CkB2—Cincinnati silt loam, 2 to 6 percent slopes, eroded. This gently sloping, deep, well drained soil is on narrow ridgetops and nose slopes in the uplands. It has a fragipan. Areas are irregular in shape and are 3 to 6 acres in size. Slopes are 50 to 150 feet long.

In a typical profile, the surface layer is dark brown silt loam about 7 inches thick. The subsoil extends to a depth of about 80 inches. It is brown, firm silt loam in the upper part; a fragipan of yellowish brown, very firm, brittle silt loam and loam in the next part; and yellowish brown, firm clay loam in the lower part. In a few areas the soil does not have a fragipan.

Included with this soil in mapping are small areas of the moderately well drained Rossmoyne soils on narrow nose slopes. Also included are a few areas of colluvial soils in small drainageways. Included soils make up about 12 to 15 percent of the unit.

The Cincinnati soil is moderately permeable above the fragipan and slowly permeable in the pan. It has a seasonal high water table at a depth of more than 4 feet. Available water capacity is moderate. Organic matter content is moderately low in the surface layer. Surface runoff is medium in cultivated areas. The surface layer is dominantly medium acid. It is friable and can be easily tilled throughout a fairly wide range in moisture content. Root penetration is restricted by the fragipan.

Most areas are used for cultivated crops. Some are used as hayland, pasture, or woodland.

This soil is suited to corn, soybeans, and small grain. Measures that control erosion and runoff are needed if cultivated crops are grown. Examples are a cropping sequence that includes grasses and legumes, a conservation tillage system that leaves all or part of the crop residue on the surface, and a combination of contour farming and grassed waterways.

This soil is suited to some of the grasses and legumes used for hay and pasture. The deep rooted legumes, however, are restricted by the fragipan. Most legume stands last from 1 to 3 years. Interseeding legumes helps to maintain the stand. The major concern of management is overgrazing or grazing during wet periods. Grazing when the soil is wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

A few areas are wooded with hardwoods. This soil is well suited to trees. Seedling mortality, the windthrow hazard, and plant competition are management concerns. Seedlings survive and grow well if competing vegetation is controlled by site preparation or by spraying, cutting, or girdling. Excluding livestock helps to prevent deterioration of the woodland. Harvesting mature trees and fostering the growth of seed trees improve the woodland.

The shrink-swell potential is a moderate limitation if this soil is used as a site for dwellings. Also, the wetness is a limitation on sites for dwellings with basements. A subsurface drainage system around the footings helps to remove any seepage water on the fragipan. Backfilling with coarse material helps to prevent the structural damage caused by shrinking and swelling. Low strength and frost action are severe limitations on sites for local roads and streets. Providing coarse grained subgrade or base material helps to prevent the damage caused by low strength. Roadside ditches help to remove excess water and thus help to prevent the damage caused by frost action.

The slow permeability is a severe limitation if this soil is used as a septic tank absorption field. Enlarging the absorption field and installing perimeter drains around the field, however, help to overcome this limitation.

The capability subclass is IIe; woodland suitability subclass 2d.

CkC2—Cincinnati silt loam, 6 to 12 percent slopes, eroded. This moderately sloping, deep, well drained soil is on side slopes in the uplands. It has a fragipan. Areas are long and irregular in shape and are 3 to 12 acres in size. Slopes are 50 to 150 feet long.

In a typical profile, the surface layer is about 8 inches of dark brown silt loam mixed with some yellowish brown subsoil material. The subsoil extends to a depth of about 80 inches. It is yellowish brown, firm and very firm silty clay loam in the upper part; a fragipan of yellowish brown and brown, firm and very firm silty clay loam, loam, and clay in the next part; and brown, firm clay loam in the lower part. In a few areas the slope is as much as 15 percent.

Included with this soil in mapping are small areas of the moderately well drained Rossmoyne soils on head slopes. These soils make up about 8 percent of the unit. Also included are small areas of colluvial soils in drainageways. These soils make up about 3 percent of the unit.

The Cincinnati soil is moderately permeable above the fragipan and slowly permeable in the pan. It has a seasonal high water table at a depth of more than 4 feet. Available water capacity is moderate. Organic matter content is moderate in the surface layer. Surface runoff is medium. The surface layer is dominantly slightly acid or medium acid. It is friable. Root penetration is restricted by the fragipan.

Most areas are wooded with hardwoods. A few are used for cultivated crops or for hay and pasture.

This soil is suited to corn, soybeans, and small grain if further erosion, which is a severe hazard, is controlled. Cover crops, a cropping sequence that includes grasses and legumes, a conservation tillage system that leaves all or part of the crop residue on the surface, terraces, diversions, a combination of contour farming and grassed waterways, and grade stabilization structures help to control runoff and prevent excessive soil loss. Generally, more than one of these measures is needed. Cover crops also help to maintain tilth and increase the organic matter content.

This soil is well suited to some of the grasses and legumes used for hay and pasture. The deeper rooted legumes, however, are restricted by the fragipan. A cover of grasses and legumes is effective in controlling erosion. Overgrazing or grazing when the soil is wet, however, causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is well suited to trees. Seedling mortality, the windthrow hazard, and plant competition are the main management concerns. Seedlings survive and grow well if competing vegetation is controlled by site preparation or by spraying, cutting, or girdling. Harvesting methods that do not isolate the remaining trees or leave them widely spaced help to prevent windthrow. Excluding livestock helps to prevent deterioration of the woodland. Harvesting mature trees and fostering the growth of seed trees improve the woodland.

The slope and the shrink-swell potential are moderate limitations if this soil is used as a site for dwellings. Also, the wetness is a limitation on sites for dwellings with basements. A subsurface drainage system around the footings helps to remove any seepage water on the fragipan. Backfilling with coarse material helps to prevent the structural damage caused by shrinking and swelling. Buildings should be designed to conform to the natural slope of the land. Diversion terraces and grassed waterways between lots help to control erosion. Restricting building site development to small areas, removing as little of the plant cover as possible, and revegetating as soon as possible after construction also help to control erosion. Sediment-settling basins help to control siltation.

Low strength and frost action are severe limitations if this soil is used as a site for local roads and streets. Roadside ditches help to lower the water table and thus help to prevent the damage caused by frost action. Providing coarse grained subgrade or base material helps to prevent the damage caused by low strength and frost action.

The slow permeability is a severe limitation if this soil is used as a septic tank absorption field. Enlarging the absorption field, however, helps to overcome this limitation.

The capability subclass is IIIe; woodland suitability subclass 2d.

CkC3—Cincinnati silt loam, 6 to 12 percent slopes, severely eroded. This moderately sloping, deep, well drained soil is on side slopes in the uplands. It has a fragipan. Areas are long and irregular in shape and are 3 to 15 acres in size. Slopes are 50 to 150 feet long.

In a typical profile, the surface layer is brown silt loam about 4 inches thick. The subsoil is about 56 inches thick. It is yellowish brown, firm silt loam in the upper part; a fragipan of yellowish brown, very firm loam and clay loam in the next part; and brown, firm clay loam in the lower part. The substratum to a depth of 80 inches is yellowish brown, mottled loam. In some areas the soil has very coarse prismatic structure directly below the plow layer.

Included with this soil in mapping are small areas of colluvial soils in drainageways. These soils make up about 4 percent of the unit.

The Cincinnati soil is moderately permeable above the fragipan and slowly permeable in and below the pan. It has a seasonal high water table at a depth of more than 4 feet. Available water capacity is low. Organic matter content is moderately low because of the loss of surface soil through erosion. Surface runoff is rapid. The surface layer is dominantly strongly acid unless limed. It is firm or friable. Clods tend to form if the soil is not tilled within the proper range of moisture content. Root penetration is restricted by the fragipan.

Most areas are used for cultivated crops. Most other areas are used for hay and pasture. Some are used as woodland.

This soil is poorly suited to corn, soybeans, and small grain because of a severe hazard of further erosion. Cover crops, a cropping sequence that includes grasses and legumes, a conservation tillage system that leaves all or part of the crop residue on the surface, terraces, diversions, a combination of contour farming and grassed waterways, and grade stabilization structures help to control runoff and prevent excessive soil loss. Generally, more than one of these measures is needed. Cover crops also help to maintain tilth and increase the organic matter content.

This soil is suited to some of the grasses and legumes used for hay and pasture. The deeper rooted legumes, however, are restricted by the fragipan. A cover of grasses and legumes is effective in controlling erosion. Overgrazing or grazing when the soil is wet, however, causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

A few areas are wooded with hardwoods. This soil is well suited to trees. Seedling mortality, the windthrow hazard, and plant competition are the major concerns of management. Seedlings survive and grow well if competing vegetation is controlled by site preparation or by spraying, cutting, or girdling. Harvesting methods that do not isolate the remaining trees or leave them widely spaced help to prevent windthrow. Excluding livestock helps to prevent deterioration of the woodland. Harvesting mature trees and fostering the growth of seed trees improve the woodland.

The slope and the shrink-swell potential are moderate limitations if this soil is used as a site for dwellings. Also, the wetness is a limitation on sites for dwellings with basements. A subsurface drainage system around the footings helps to remove any seepage water on the fragipan. Backfilling with coarse material helps to prevent the structural damage caused by shrinking and swelling. Buildings should be designed to conform to the natural slope of the land. Diversion terraces and grassed waterways between lots help to control erosion. Restricting building site development to small areas, removing as little of the plant cover as possible, and revegetating as soon as possible after construction also help to control erosion. Sediment-settling basins help to control siltation.

Low strength and frost action are severe limitations if this soil is used as a site for local roads and streets. Roadside ditches help to lower the water table and thus help to prevent the damage caused by frost action. Providing coarse grained subgrade or base material helps to prevent the damage caused by low strength and frost action.

The slow permeability is a severe limitation if this soil is used as a septic tank absorption field. Enlarging the absorption field, land leveling, and installing the distribution lines across the slope generally improve the effectiveness of the absorption field.

The capability subclass is IVe; woodland suitability subclass 2d.

Cm—Clermont silt loam. This nearly level, deep, poorly drained soil is in broad swales on uplands. It is frequently ponded. Areas are irregular in shape. They are dominantly about 400 acres in size but range from 5 to 2,000 acres. Slopes are 200 to 3,000 feet long.

In a typical profile, the surface layer is grayish brown, mottled silt loam about 6 inches thick. The subsurface layer is light gray, mottled silt loam about 13 inches thick. The subsoil to a depth of about 80 inches is mottled silt loam. It is light gray in the upper part and yellowish brown in the lower part. It is firm, and about half of the upper part is brittle. In some areas a fragipan is below a depth of 30 inches.

This soil is very slowly permeable. It has a seasonal high water table near or above the surface for much of the year and tends to remain ponded after periods of sustained rainfall. Available water capacity is high. Organic matter content is moderately low in the surface layer. Surface runoff is very slow. The surface layer is dominantly neutral where limed or is medium acid. It is friable and can be easily tilled throughout a fairly wide range in moisture content.

Most areas are used for cultivated crops. A few are used for hay, pasture, or woodland.

This soil is suited to corn, soybeans, and small grain. The wetness is the major limitation. Ponding and frost heaving damage small grain crops during some years. If an adequate drainage system is installed, row crops can be grown in most years. A surface drainage system is needed. Land leveling and shaping help to control surface water. Bedding ridges help to keep the plants above the water table. Cover crops and a conservation tillage system that leaves all or part of the crop residue on the surface increase the organic matter content and help to maintain good tilth.

This soil is suited to some of the grasses and legumes used for hay and pasture. The deep rooted legumes, however, are poorly suited because of the prolonged seasonal high water table. The major concerns of management are overgrazing and grazing during wet periods. Grazing when the soil is wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in excellent condition.

This soil is suited to trees (fig. 6). The equipment limitation, seedling mortality, the windthrow hazard, and plant competition are management concerns. Trees should be harvested, logged, or planted during dry periods or during periods when the ground is frozen. Water tolerant species should be selected for planting. Seedlings survive and grow well if competing vegetation is controlled by cutting, spraying, or girdling. Excluding livestock helps to prevent deterioration of the woodland. Harvesting mature trees and fostering the growth of seed trees improve the woodland.

This soil generally is unsuitable as a site for buildings and sanitary facilities because the ponding is a severe limitation. Low strength, ponding, and frost action are severe limitations on sites for local roads and streets. Constructing roads on raised, well compacted fill material and providing adequate side ditches and culverts help to prevent the damage caused by ponding and frost action. Providing coarse grained subgrade or base material helps to prevent the damage caused by low strength.

The capability subclass is IIIw; woodland suitability subclass 2w.

CnG—Corydon-Rock outcrop complex, 15 to 35 percent slopes. This map unit occurs as areas of a strongly sloping to steep, shallow, well drained Corydon soil intricately mixed with areas of Rock outcrop. It is on side slopes on uplands and terraces adjacent to streams. Areas range from 5 to 20 acres in size. They are 55 to 70 percent Corydon soil and 20 to 30 percent Rock outcrop. The Corydon soil and the Rock outcrop occur as areas so intricately mixed or so small that mapping them separately is not practical. Slopes are 50 to 150 feet long, and vertical limestone escarpments are 10 to 60 feet high.

In a typical profile of the Corydon soil, the surface layer is very dark grayish brown silt loam about 3 inches thick. The subsoil is dark brown, friable silt loam about 12 inches thick. Light gray hard limestone bedrock is at a depth of about 15 inches. In places it is within a depth of 10 inches. In some areas the subsoil has clay films. In other areas the soil contains more clay and is 20 to 40 inches deep over shale and limestone.

The Rock outcrop typically is exposed hard limestone. In some areas it is covered by lichens.

Included with the Corydon soil and the Rock outcrop in mapping are a few very small areas of the deep Hennepin soils on side slopes. These soils make up about 5 percent of the unit.

Permeability is moderate in the Corydon soil, and available water capacity is very low. Organic matter content is moderate in the surface layer. Surface runoff is very rapid. The surface layer is neutral. It is friable. The root zone is only 10 to 20 inches thick.

All areas are woodland. The Corydon soil is generally unsuited to cultivated crops and is poorly suited to pasture because of the hazard of erosion and the shallowness to bedrock. Constructing diversions and establishing an adequate plant cover help to prevent excessive soil loss in pastured areas. Overgrazing or grazing when the soil is wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

The Corydon soil is poorly suited to trees. The major concern of management is seedling mortality, which is severe because of the shallowness to bedrock. Other concerns are the erosion hazard, the equipment limitation, and the windthrow hazard. The loss of tree seedlings during dry periods can be in excess of 50 percent. Planting container-grown stock helps to achieve a better survival rate. Special logging methods, such as yarding logs uphill with a cable, may be needed because ordinary crawler tractors and rubber-tired skidders cannot operate safely on the steeper slopes. Harvesting methods that do not isolate the remaining trees or leave them widely spaced help to prevent windthrow. A periodic salvaging of the windthrown trees is needed in some areas. Excluding livestock helps to prevent deterioration of the woodland. Harvesting mature trees and fostering the growth of seed trees improve the woodland.

This map unit is generally unsuitable as a site for buildings, sanitary facilities, and local roads and streets because of the slope, the vertical limestone escarpments, and the shallowness to bedrock.

The capability subclass is VIIe; woodland suitability subclass 5d.

CrA—Crosby silt loam, 0 to 3 percent slopes. This nearly level, deep, somewhat poorly drained soil is on broad glacial till plains. Areas are irregular in shape. They are dominantly about 15 acres in size but range from 3 to 35 acres. Slopes are 100 to 300 feet long.

In a typical profile, the surface layer is dark grayish brown, mottled silt loam about 6 inches thick. The subsurface layer is grayish brown, mottled silt loam about 4 inches thick. The subsoil is about 23 inches thick. It is firm and is mottled. It is light brownish gray, grayish brown, and yellowish brown clay loam in the upper part and yellowish brown loam in the lower part.

The substratum to a depth of 60 inches is brown loam. In some small areas, the surface soil and subsoil are more clayey throughout and the subsoil extends to a depth of about 48 inches. In other areas limestone bedrock is at a depth of 40 to 60 inches. In some small areas the upper part of the subsoil contains less sand.

Figure 6.—An area of Clermont silt loam supporting oak trees.

Included with this soil in mapping are a few small areas of the moderately well drained Williamstown soils on swells and some small areas of the poorly drained Cyclone soils and colluvial soils in narrow drainageways and small swales. These soils each make up about 4 percent of the unit.

The Crosby soil is slowly permeable. It has a seasonal high water table at a depth of 1 to 3 feet. Available water capacity is high. Organic matter content is moderately low in the surface layer. Surface runoff is slow. The surface layer is dominantly slightly acid or neutral. It is friable and can be easily tilled throughout a fairly wide range in moisture content. The shrink-swell potential is moderate.

Most areas are used for cultivated crops. A few are used for hay, pasture, or woodland.

This soil is well suited to corn, soybeans, and small grain. The wetness is the major limitation. If an adequate drainage system is installed, row crops can be grown in most years. A surface drainage system and a subsurface drainage system are effective in removing excess water. Diversions help to prevent the wetness caused by runoff from the adjacent higher lying soils. Cover crops and a conservation tillage system that leaves all or part of the crop residue on the surface increase the organic matter content and help to maintain good tilth.

This soil is suited to grasses and legumes for hay and pasture, especially to deep rooted legumes that are tolerant of a seasonal high water table. The major concerns of management are overgrazing and grazing during wet periods. Grazing when the soil is wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in excellent condition.

This soil is suited to trees. Plant competition is the main management concern. Seedlings survive and grow well if competing vegetation is controlled by site preparation or by spraying, cutting, or girdling. Excluding livestock helps to prevent deterioration of the woodland. Harvesting mature trees and fostering the growth of seed trees improve the woodland.

The wetness is a severe limitation and the shrink-swell potential a moderate limitation if this soil is used as a site for buildings. Installing an adequate subsurface drainage system that lowers the seasonal high water table helps to overcome the wetness. Reinforcing foundations, footings, and basement walls and backfilling with coarse material help to prevent the structural damage caused by shrinking and swelling. Frost action and low strength are severe limitations on sites for local roads and streets. Adequate road ditches help to lower the water table and thus help to prevent the damage caused by frost action. Providing coarse grained subgrade or base material helps to prevent the damage caused by low strength and frost action.

The wetness and the slow permeability are severe limitations if this soil is used as a septic tank absorption field. Installing perimeter drains around the field helps to overcome the wetness. Enlarging the absorption field or installing the field in 2 or 3 feet of suitable fill material helps to overcome the slow permeability.

The capability subclass is IIw; woodland suitability subclass 3o.

Cy—Cyclone silt loam. This nearly level, deep, poorly drained soil is on broad flats, in small drainageways, or in slight depressions on uplands. It is frequently ponded by surface runoff from the adjacent higher lying areas. Areas are irregular in shape. They are dominantly about 25 acres in size but range from 2 to 150 acres.

In a typical profile, the surface layer is very dark grayish brown silt loam about 9 inches thick. The subsurface layer is dark olive gray, mottled silt loam about 7 inches thick. The subsoil is about 44 inches thick. It is mottled and firm. It is very dark gray and brown silty clay loam and silt loam in the upper part and yellowish brown loam in the lower part. The substratum to a depth of 65 inches is brown loam. In some small areas, the lower part of the subsoil contains more sand and the surface soil and subsoil contain more clay. In other areas the soil is overlain by 6 to 16 inches of dark grayish brown and dark brown silt loam. In places bedrock is at a depth of 40 to 60 inches.

Included with this soil in mapping are a few small, convex areas of the somewhat poorly drained Crosby and Fincastle soils. These soils make up about 4 percent of the unit.

The Cyclone soil is moderately permeable. It has a seasonal high water table near or above the surface during the winter and spring. Available water capacity is high. Organic matter content is high in the surface layer. Surface runoff is very slow or ponded. The surface layer is dominantly neutral. It is friable and can be easily tilled unless it is too wet. If the soil is tilled when too wet, large clods form. They become very firm when they dry. As a result of the clods, preparing a seedbed is difficult.

Most areas are used for cultivated crops. A few are used for hay, pasture, or woodland.

If adequately drained, this soil is well suited to corn, soybeans, and small grain. If drained and otherwise well managed, it is suited to intensive row cropping. The wetness is the main limitation. Ponding (fig. 7) and frost heaving damage crops, especially small grain crops, during some years. Excess water can be removed by subsurface drains, surface drains, open ditches, or pumps or by a combination of these. A conservation tillage system that leaves all or part of the crop residue on the surface helps to maintain tilth and increases the organic matter content.

This soil is suited to shallow rooted grasses and legumes for hay or pasture. It is poorly suited, however, to many deep rooted legumes because of the seasonal high water table and because of the ponding in many

Figure 7.—*Ponding on Cyclone silt loam. Fincastle silt loam, 2 to 4 percent slopes, is in the background.*

areas. A drainage system is needed. Overgrazing or grazing when the soil is wet causes surface compaction and poor tilth. Overgrazing also reduces the plant density and plant hardiness. Proper stocking rates, rotation grazing, timely deferment of grazing, and restricted use during wet periods help to prevent surface compaction and help to maintain good tilth and plant density.

This soil is suited to trees. The major concerns of management are plant competition, the equipment limitation, seedling mortality, and the windthrow hazard. Trees should be harvested or logged during dry periods or during periods when the ground is frozen. Water tolerant species should be selected for planting. Seedlings survive and grow well if competing vegetation is controlled by cutting, spraying, or girdling. Harvesting methods that do not isolate the remaining trees or leave them widely spaced help to prevent windthrow. Excluding livestock helps to prevent deterioriation of the woodland. Harvesting mature trees and fostering the growth of seed trees improve the woodland.

This soil is generally unsuitable as a site for buildings and sanitary facilities because of the ponding. The ponding, frost action, and low strength are severe limitations on sites for local roads and streets. Providing adequate drainage ditches, elevating the base of the road, and strengthening or replacing the base material help to overcome these limitations.

The capability subclass is IIw; woodland suitability subclass 2w.

FcA—Fincastle silt loam, 0 to 2 percent slopes. This nearly level, deep, somewhat poorly drained soil is on broad, loess covered glacial till plains. Areas are irregular in shape. They are dominantly about 19 acres in size but range from 3 to 50 acres. Slopes are 100 to 400 feet long.

In a typical profile, the surface layer is grayish brown silt loam about 8 inches thick. The subsurface layer is grayish brown, mottled silt loam about 2 inches thick. The subsoil is about 44 inches thick. It is yellowish brown, mottled, and firm. It is silty clay loam in the upper part and loam in the lower part. The substratum to a depth of 60 inches is yellowish brown loam. In a few areas the soil formed entirely in loess. In some areas the substratum is sandy loam and is more permeable. In other areas the surface soil and subsoil are browner. In places bedrock is at a depth of 40 to 72 inches.

Included with this soil in mapping are a few small areas of the moderately well drained Xenia soils along drainageways and small areas of colluvial soils and the poorly drained Cyclone soils in drainageways. These soils make up about 5 to 10 percent of the unit.

The Fincastle soil is moderately slowly permeable in the subsoil and slowly permeable in the underlying till. It has a seasonal high water table at a depth of 1 to 3 feet. Available water capacity is high. Organic matter content is moderately low in the surface layer. Surface runoff is slow. The surface layer is slightly acid or neutral. It is friable and can be easily tilled throughout a fairly wide range in moisture content. The shrink-swell potential is moderate.

Most areas are used for cultivated crops. A few are used for hay, pasture, or woodland.

This soil is well suited to corn, soybeans, and small grain (fig. 8). The wetness is the major limitation. If an adequate drainage system is installed, row crops can be grown in most years. A surface drainage system and a subsurface drainage system help to lower the water table. Diversions help to prevent the wetness caused by runoff from the adjacent higher lying soils. Cover crops and a conservation tillage system that leaves all or part of the crop residue on the surface increase the organic matter content and help to maintain good tilth.

This soil is suited to grasses and legumes for hay and pasture, especially to the deeper rooted legumes that are tolerant of a seasonal high water table. The major concerns of management are overgrazing and grazing during wet periods. Grazing when the soil is wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in excellent condition.

This soil is suited to trees. The major concern of management is plant competition. Seedlings survive and grow well if competing vegetation is controlled by site preparation or by spraying, cutting, or girdling. Harvesting and planting commonly are delayed until dry periods because of the wetness. Excluding livestock helps to prevent deterioration of the woodland. Harvesting mature trees and fostering the growth of seed trees improve the woodland.

The wetness is a severe limitation and the shrink-swell potential a moderate limitation if this soil is used as a site for buildings. Installing a subsurface drainage system and foundation drains that lower the seasonal high water table helps to overcome the wetness. Reinforcing foundations, footings, and basement walls and backfilling with coarse material help to prevent the structural damage caused by shrinking and swelling. Low strength and frost action are severe limitations on sites for local roads and streets. Drainage ditches help to lower the water table and thus help to prevent the damage caused by frost action. Providing coarse grained subgrade or base material helps to prevent the damage caused by low strength and frost action.

The wetness and the moderately slow and slow permeability are severe limitations if this soil is used as a septic tank absorption field. Installing perimeter drains around the field helps to overcome the wetness. Enlarging the absorption field or installing the field in 2 or 3 feet of suitable fill material helps to overcome the slow permeability.

The capability subclass is IIw; woodland suitability subclass 3o.

FcB—Fincastle silt loam, 2 to 4 percent slopes. This gently sloping, deep, somewhat poorly drained soil is on side slopes on loess covered glacial till plains. Areas are elliptical or are irregular in shape and are 3 to 20 acres in size. Slopes are 70 to 300 feet long.

In a typical profile, the surface layer is dark grayish brown silt loam about 9 inches thick. The subsurface layer is light brownish gray, mottled silt loam about 4 inches thick. The subsoil is about 34 inches thick. It is yellowish brown, mottled, and firm. It is silt loam and silty clay loam in the upper part and clay loam in the lower part. The substratum to a depth of 60 inches is yellowish brown loam. In some areas the soil does not have a loess mantle and is browner in the upper part. In other areas the substratum contains more sand.

Included with this soil in mapping are a few small areas of the moderately well drained Xenia soils near

Figure 8.—Corn on Fincastle silt loam, 0 to 2 percent slopes.

drainageways and small areas of colluvial soils and the poorly drained Cyclone soils in drainageways. These soils make up about 10 to 15 percent of the unit.

The Fincastle soil is moderately slowly permeable in the subsoil and slowly permeable in the underlying till. It has a seasonal high water table at a depth of 1 to 3 feet. Available water capacity is high. Organic matter content is moderately low in the surface layer. Surface runoff is medium. The surface layer is slightly acid or neutral. It is friable and can be easily tilled throughout a fairly wide range in moisture content. The shrink-swell potential is moderate.

Most areas are used for cultivated crops. A few are used for hay, pasture, or woodland.

This soil is well suited to corn, soybeans, and small grain. Erosion is the major hazard, and wetness is the major limitation. Measures that control erosion and runoff are needed if cultivated crops are grown. Examples are a cropping sequence that includes grasses and legumes, a conservation tillage system that leaves all or part of the crop residue on the surface, contour farming, and sod strips or grassed waterways. If an adequate drainage system is installed and erosion is controlled, row crops can be grown in most years. A subsurface drainage system is needed to lower the water table. Diversions help to prevent the wetness caused by runoff from the adjacent higher lying soils. Cover crops increase the organic matter content and help to maintain good tilth.

This soil is suited to grasses and legumes for hay and pasture, especially to the deeper rooted legumes that are tolerant of a seasonal high water table. The major concerns of management are overgrazing and grazing during wet periods. Grazing when the soil is wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in excellent condition.

A few areas are wooded with hardwoods. This soil is suited to trees. Plant competition is the major concern of management. Seedlings survive and grow well if competing vegetation is controlled by site preparation or by spraying, cutting, or girdling. Harvesting and planting commonly are delayed until dry periods because of the wetness. Excluding livestock helps to prevent deterioration of the woodland. Harvesting mature trees and fostering the growth of seed trees improve the woodland.

The wetness is a severe limitation and the shrink-swell potential and low strength moderate limitations if this soil is used as a site for buildings. Installing a subsurface drainage system and foundation drains that lower the seasonal high water table helps to overcome the wetness. Reinforcing foundations and footings and backfilling with coarse material help to prevent the structural damage caused by low strength and by shrinking and swelling.

Low strength and frost action are severe limitations if this soil is used as a site for local roads and streets. Providing coarse grained subgrade or base material helps to prevent the damage caused by low strength and frost action.

The wetness and the moderately slow and slow permeability are severe limitations if this soil is used as a septic tank absorption field. Enlarging the absorption field and installing a drainage system that removes the runoff help to overcome the wetness and the slow permeability. Installing the field in a suitable fill material also helps to overcome the slow permeability.

The capability subclass is IIe; woodland suitability subclass 3o.

FoA—Fox loam, 0 to 2 percent slopes. This nearly level, well drained soil is on outwash plains, terraces, and kames. It is moderately deep to very gravelly coarse sand. Areas are irregular in shape and are 2 to 30 acres in size. Slopes are 100 to 400 feet long.

In a typical profile, the surface layer is dark grayish brown loam about 10 inches thick. The subsoil is about 20 inches of dark brown, firm gravelly loam and gravelly sandy clay loam. The substratum to a depth of 60 inches is dark brown very gravelly coarse sand. In some small areas the content of coarse chert fragments is more than 25 percent in the surface layer and subsoil. In other areas the surface layer is darker. In places the depth to the substratum is more than 40 inches.

Permeability is moderate in the subsoil and rapid in the substratum. Available water capacity is moderate. Organic matter content is moderate in the surface layer. Surface runoff is slow. The surface layer is friable and can be easily tilled throughout a fairly wide range in moisture content. The shrink-swell potential is moderate.

Most areas are used for cultivated crops. Some are used for hay or pasture. A few are wooded with hardwoods.

This soil is suited to corn, soybeans, and small grain. Droughtiness is the main management concern. It can be overcome, however, by planting early maturing crops or by irrigating. Cover crops and a conservation tillage system that leaves crop residue on the surface help to maintain tilth and increase the organic matter content.

This soil is suited to hay or pasture. The major concern of management is overgrazing, which causes surface compaction, excessive runoff, and poor tilth and reduces plant density. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is suited to trees. Plant competition is the main management concern. Seedlings survive and grow well if competing vegetation is controlled by site preparation or by spraying, cutting, or girdling. Excluding livestock helps to prevent deterioration of the woodland. Harvesting mature trees and fostering the growth of seed trees improve the woodland.

The shrink-swell potential is a moderate limitation if this soil is used as a site for buildings without basements. Reinforcing foundations and footings, however, helps to prevent the structural damage caused by shrinking and swelling. Frost action and the shrink-swell potential are moderate limitations on sites for local roads and streets. Providing coarse grained subgrade or base material, however, helps to prevent the damage caused by frost action and by shrinking and swelling.

This soil readily absorbs but does not adequately filter

the effluent in septic tank absorption fields. The poor filtering capacity may result in the pollution of ground water supplies.

The capability subclass is IIs; woodland suitability subclass 2o.

FoB—Fox loam, 2 to 6 percent slopes. This gently sloping, well drained soil is on short side slopes near small drainageways on outwash plains, terraces, and kames. It is moderately deep to very gravelly coarse sand. Areas are elongated and are 2 to 20 acres in size. Slopes are 50 to 200 feet long.

In a typical profile, the surface layer is dark brown loam about 8 inches thick. The subsoil is about 27 inches thick. It is dark yellowish brown, firm clay loam in the upper part and dark brown, firm gravelly clay loam and clay loam in the lower part. The substratum to a depth of 60 inches is yellowish brown very gravelly coarse sand. In some small areas the content of coarse chert fragments is more than 25 percent in the surface layer and subsoil. In other areas the surface layer is darker. In some places the depth to the substratum is more than 40 inches. In other places, the slope is more than 6 percent and the surface layer is clay loam.

Permeability is moderate in the surface layer and subsoil and rapid in the substratum. Available water capacity is moderate. Organic matter content is moderate in the surface layer. Surface runoff is medium. The surface layer is friable and can be easily tilled throughout a fairly wide range in moisture content. The shrink-swell potential is moderate.

Most areas are used for cultivated crops. Some are used for hay or pasture. A few are wooded with hardwoods.

This soil is suited to corn, soybeans, and small grain. Erosion and droughtiness are the major management concerns. Measures that control erosion and runoff are needed if cultivated crops are grown. Examples are cover crops, a cropping sequence that includes grasses and legumes, a conservation tillage system that leaves all or part of the crop residue on the surface, a combination of contour farming and grassed waterways, and grade stabilization structures. Cover crops also help to maintain tilth and increase the organic matter content. The droughtiness can be overcome by planting early maturing crops or by irrigating.

Growing grasses and legumes for hay or pasture is effective in controlling wind and water erosion. Overgrazing, however, causes surface compaction, excessive runoff, and poor tilth and reduces plant density. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is suited to trees. Plant competition is the main management concern. Seedlings survive and grow well if competing vegetation is controlled by site preparation or by spraying, cutting, or girdling. Excluding livestock helps to prevent deterioration of the woodland. Harvesting mature trees and fostering the growth of seed trees improve the woodland.

The shrink-swell potential is a moderate limitation if this soil is used as a site for buildings without basements. Reinforcing foundations and footings, however, helps to prevent the structural damage caused by shrinking and swelling. Frost action and the shrink-swell potential are moderate limitations on sites for local roads and streets. Providing coarse grained subgrade or base material, however, helps to overcome these limitations.

This soil readily absorbs but does not adequately filter the effluent in septic tank absorption fields. The poor filtering capacity may result in the pollution of ground water supplies.

The capability subclass is IIe; woodland suitability subclass 2o.

GfD—Grayford silt loam, 10 to 20 percent slopes. This strongly sloping, deep, well drained soil is on upland side slopes and back slopes, generally adjacent to the major streams. Areas are long and narrow and are 4 to 15 acres in size. Slopes are 50 to 175 feet long.

In a typical profile, the surface layer is very dark grayish brown silt loam about 3 inches thick. The subsurface layer is light yellowish brown silt loam about 4 inches thick. The subsoil is about 41 inches thick. The upper part is yellowish brown and reddish brown, firm clay loam, and the lower part is reddish brown, firm clay. Limestone bedrock is at a depth of about 48 inches. In some areas, the soil is severely eroded and the surface layer is brown or yellowish brown silty clay loam or silt loam. In other areas the lower part of the subsoil did not form in residuum. In some places bedrock is at a depth of 20 to 40 inches. In other places the slope is as much as 25 percent.

Included with this soil in mapping are small scattered areas of the Corydon-Rock outcrop complex. Corydon soils are shallow. Included areas make up about 8 to 15 percent of the unit.

Permeability is moderate in the Grayford soil, and available water capacity is high. Organic matter content is moderately low. Surface runoff is rapid in cultivated areas. The surface layer is dominantly medium acid. It is friable and can be easily tilled throughout a fairly wide range in moisture content. The shrink-swell potential is moderate in the upper part of the subsoil.

Most areas are woodland, pasture, or hayland. A few are used for cultivated crops.

This soil is poorly suited to cultivated crops because of a severe hazard of erosion. It should be planted to small grain only to reestablish hay and pasture. If row crops are grown, diversions, cover crops, and a conservation

tillage system that leaves all or part of the crop residue on the surface help to prevent excessive soil loss.

This soil is suited to hay or pasture. The major concern of management is overgrazing or grazing during wet periods. Grazing when the soil is wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is well suited to trees. Plant competition is the major concern of management. Seedlings survive and grow well if competing vegetation and erosion are controlled. The competing trees and shrubs can be controlled by site preparation or by spraying, cutting, or girdling. Excluding livestock helps to prevent deterioration of the woodland. Harvesting mature trees and fostering the growth of seed trees improve the woodland.

The slope is a severe limitation and the shrink-swell potential a moderate limitation if this soil is used for building site development. Buildings should be designed to conform to the natural slope of the land. Reinforcing foundations, footings, and basement walls and backfilling with coarse material help to prevent the structural damage caused by shrinking and swelling. Diversion terraces and grassed waterways between lots help to control erosion. Restricting building site development to small areas, removing as little of the plant cover as possible, and revegetating as soon as possible after construction also help to control erosion. Sediment-settling basins help to control siltation.

The slope and frost action are severe limitations if this soil is used as a site for local roads and streets. Building the roads on the contour helps to overcome the slope. Strengthening or replacing the base material helps to prevent the damage caused by frost action.

The slope is a severe limitation if this soil is used as a septic tank absorption field. Also, the depth to bedrock is a moderate limitation. Land shaping and installing the distribution lines across the slope generally improve the effectiveness of the absorption field. In areas where the slope is more than 15 percent, however, these measures are not likely to be effective. An alternative site should be selected.

The capability subclass is IVe; woodland suitability subclass 1o.

GrC2—Grayford-Ryker silt loams, 4 to 10 percent slopes, eroded. These gently sloping and moderately sloping, deep, well drained soils are on hummocky ridgetops and side slopes. Areas are irregular in shape. They are dominantly about 12 acres in size but range from 4 to 30 acres. They are 35 to 55 percent Grayford soil and 30 to 45 percent Ryker soil. The two soils occur as areas so intricately mixed or so small that mapping them separately it is not practical. Slopes are 50 to 150 feet long.

In a typical profile of the Grayford soil, the surface layer is dark brown silt loam about 7 inches thick. The subsoil is about 35 inches thick. It is yellowish brown and strong brown, firm silty clay loam and loam in the upper part and red and dark brown, firm clay loam and silty clay in the lower part. Limestone bedrock is at a depth of about 42 inches. In some places the loess is 24 to 36 inches thick. In other places the upper part of the subsoil is clay loam or loam weathered from till.

In a typical profile of the Ryker soil, the surface layer is brown silt loam about 7 inches thick. The subsoil is about 73 inches thick. It is yellowish brown and strong brown, firm silt loam in the upper part and red, firm clay loam in the lower part. Limestone bedrock is at a depth of about 80 inches. In some areas the surface layer is yellowish brown silt loam or silty clay loam. In other areas the lower part of the subsoil is more clayey. In places bedrock is at a depth of 60 to 80 inches.

Included with these soils in mapping are areas of soils that are not underlain by residuum and areas where bedrock is as shallow as 33 inches. These included areas are in positions on the landscape similar to those of the Grayford and Ryker soils. Also included are narrow areas of colluvial soils in drainageways. Included areas make up about 10 to 15 percent of the unit.

Permeability is moderate in the Grayford and Ryker soils, and available water capacity is high. Organic matter content is moderately low. Surface runoff is medium in cultivated areas. The surface layer is dominantly medium acid and slightly acid. It is friable and can be easily tilled throughout a fairly wide range in moisture content. The shrink-swell potential is moderate.

Most areas are used for cultivated crops. Some are used for pasture, hay, or woodland.

These soils are suited to corn, soybeans, and small grain. Measures that control erosion and runoff are needed if cultivated crops are grown. Examples are cover crops, a cropping sequence that includes grasses and legumes, a conservation tillage system that leaves all or part of the crop residue on the surface, and a combination of contour farming and grassed waterways. Cover crops also help to maintain tilth and increase the organic matter content.

These soils are well suited to hay and pasture. Growing grasses and legumes for hay and pasture is effective in controlling erosion. Overgrazing or grazing when the soils are wet, however, causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soils in good condition.

A few areas are wooded with hardwoods. These soils are well suited to trees. The major concern of management is plant competition. Seedlings survive and grow well if competing vegetation is controlled by site preparation or by spraying, cutting, or girdling. Excluding livestock helps to prevent deterioration of the woodland.

Harvesting mature trees and fostering the growth of seed trees improve the woodland.

The shrink-swell potential is a moderate limitation if these soils are used as sites for dwellings. The depth to bedrock also is a moderate limitation if the Grayford soil is used as a site for dwellings with basements. Reinforcing foundations, footings, and basement walls and backfilling with coarse material help to prevent the structural damage caused by shrinking and swelling. Low strength and frost action are severe limitations on sites for local roads and streets. Providing coarse grained subgrade or base material helps to prevent the damage caused by low strength and frost action.

The moderate permeability is a moderate limitation if these soils are used as septic tank absorption fields. The depth to bedrock in the Grayford soil also is a moderate limitation. Installing the absorption field in coarse fill material helps to overcome the moderate permeability.

The capability subclass is IIIe; woodland suitability subclass 1o.

HeG—Hennepin loam, 35 to 60 percent slopes. This very steep, deep, well drained soil is on side slopes adjacent to streams and bottom land. Areas are long and narrow. They are dominantly about 8 acres in size but range from 2 to 40 acres. Slopes are 50 to 150 feet long.

In a typical profile, the surface layer is dark grayish brown loam about 3 inches thick. The subsoil is yellowish brown, firm loam about 14 inches thick. The substratum to a depth of 60 inches is pale brown loam.

Included with this soil in mapping are a few small areas of the less sloping Miami soils on narrow ridgetops. These soils make up about 9 percent of the unit.

Permeability is moderate in the subsoil of the Hennepin soil and moderately slow in the substratum. Available water capacity is moderate. Organic matter content is moderately low in the surface layer. Surface runoff is very rapid. The surface layer is neutral or slightly acid. It is friable.

Most areas are used as woodland (fig. 9). A few are used for hay and pasture.

This soil is generally unsuited to cultivated crops and to hay and is poorly suited to pasture because of the slope. In pastured areas the major concern of management is overgrazing or grazing when the soil is wet, which causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is suited to trees. The erosion hazard and the equipment limitation are the major management concerns. Special logging methods, such as yarding logs uphill with a cable, may be needed because rubber-tired skidders and ordinary crawler tractors cannot operate safely on the very steep slopes. Seedlings survive and grow well if competing vegetation and erosion are controlled. The competing trees and shrubs can be controlled by site preparation or by spraying, cutting, or girdling. Excluding livestock helps to prevent deterioration of the woodland. Harvesting mature trees and fostering the growth of seed trees improve the woodland.

This soil generally is unsuitable as a site for buildings and sanitary facilities because the slope is a severe limitation. The slope is a severe limitation and low strength a moderate limitation on sites for local roads. Providing coarse grained subgrade or base material helps to prevent the damage caused by low strength. Building the roads on the contour helps to overcome the slope.

The capability subclass is VIIe; woodland suitability subclass 1r.

HkD2—Hickory loam, 12 to 18 percent slopes, eroded. This strongly sloping, deep, well drained soil is on back slopes, side slopes, and toe slopes in the uplands. Areas generally are elongated and are 4 to 12 acres in size. Slopes range from 50 to 225 feet long.

In a typical profile, the surface layer is dark grayish brown loam about 7 inches thick. The subsoil is dark yellowish brown and brown, firm clay loam about 43 inches thick. The substratum to a depth of 60 inches is yellowish brown clay loam. In places, the surface layer is silt loam and the upper part of the subsoil is silty clay loam.

Included with this soil in mapping are areas of Cincinnati soils. These soils are more silty than the Hickory soil. Also included are narrow areas of colluvial soils in drainageways. Included soils make up about 3 to 10 percent of the unit.

Permeability is moderate in the Hickory soil, and available water capacity is high. Organic matter content is moderately low in the surface layer. Surface runoff is rapid in cultivated areas. The surface layer dominantly is strongly acid. It is friable and can be easily tilled throughout a fairly wide range in moisture content. The shrink-swell potential is moderate.

Most areas are used for pasture or hay. Some are used as woodland. A few are used for cultivated crops.

This soil is poorly suited to cultivated crops because of a severe hazard of further erosion. It should be planted to small grain only to reestablish hay and pasture. Diversions, cover crops, and a conservation tillage system that leaves all or part of the crop residue on the surface help to prevent excessive soil loss.

This soil is suited to hay or pasture. The major concern of management is overgrazing or grazing during wet periods. Grazing when the soil is wet causes surface

Figure 9.—Native hardwoods in an area of Hennepin loam, 35 to 60 percent slopes.

compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is well suited to trees. Plant competition is the major concern of management. Seedlings survive and grow well if competing vegetation and erosion are controlled. The competing trees and shrubs can be controlled by site preparation or by spraying, cutting, or girdling. If possible, logging roads should be built on the

contour and trees planted on the contour. Excluding livestock helps to prevent deterioration of the woodland. Harvesting mature trees and fostering the growth of seed trees improve the woodland.

The slope and the shrink-swell potential are moderate limitations if this soil is used for building site development. Buildings should be designed to conform to the natural slope of the land. Reinforcing foundations, footings, and basement walls and backfilling with coarse material help to prevent the structural damage caused by shrinking and swelling. Diversion terraces and grassed waterways between lots help to control erosion. Restricting building site development to small areas, removing as little of the plant cover as possible, and revegetating as soon as possible after construction also help to control erosion. Sediment-settling basins help to control siltation.

Low strength is a severe limitation and the slope a moderate limitation if this soil is used as a site for local roads and streets. Providing coarse grained subgrade or base material helps to prevent the damage caused by low strength. Land shaping and building the roads on the contour help to overcome the slope.

The moderate permeability and the slope are moderate limitations if this soil is used as a septic tank absorption field. Land shaping and installing the distribution lines across the slope generally improve the effectiveness of the field. Installing the field in coarse fill material helps to overcome the moderate permeability. If these measures cannot overcome the limitations, an alternative site should be selected.

The capability subclass is IVe; woodland suitability subclass 1o.

HkE2—Hickory loam, 18 to 25 percent slopes, eroded. This moderately steep, deep, well drained soil is on back slopes, side slopes, and toe slopes in the uplands. Areas generally are elongated and are 4 to 30 acres in size. Slopes range from 50 to 200 feet long.

In a typical profile, the surface layer is dark brown loam about 5 inches thick. The subsoil is yellowish brown and strong brown, firm clay loam about 47 inches thick. The substratum to a depth of 60 inches is yellowish brown loam. In places, the surface layer is silt loam and the upper part of the subsoil is silty clay loam. In some areas the slope is more than 25 percent or is less than 18 percent.

Included with this soil in mapping are narrow areas of colluvial soils in drainageways. These soils make up about 3 percent of the unit.

Permeability is moderate in the Hickory soil, and available water capacity is high. Organic matter content is moderately low in the surface layer. Surface runoff is rapid. The surface layer is dominantly slightly acid. It is friable.

Many areas are used as woodland. Some are used for pasture or hay. A few are used for small grain.

This soil is generally unsuited to cultivated crops because of a very severe hazard of further erosion. It should be planted to small grain only to reestablish hay and pasture. The slope hinders the use of most kinds of farm equipment.

This soil is poorly suited to hay but is suited to pasture. The major concern of management is overgrazing or grazing during wet periods. Grazing when the soil is wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is well suited to trees. The major concerns of management are the hazard of erosion, plant competition, and the equipment limitation, which results from the moderately steep slope. Seedlings survive and grow well if competing vegetation and erosion are controlled. The competing trees and shrubs can be controlled by site preparation or by spraying, cutting, or girdling. If possible, logging roads should be built on the contour and trees planted on the contour. Excluding livestock helps to prevent deterioration of the woodland. Harvesting mature trees and fostering the growth of seed trees improve the woodland.

This soil generally is unsuitable as a site for buildings and sanitary facilities because the slope is a severe limitation. It has severe limitations as a site for local roads because of low strength and the slope. Providing coarse grained subgrade or base material helps to prevent the damage caused by low strength. Building the roads on the contour and land shaping help to overcome the slope.

The capability subclass is VIe; woodland suitability subclass 1r.

HkF—Hickory loam, 25 to 50 percent slopes. This steep and very steep, deep, well drained soil is on back slopes, side slopes, and toe slopes in the uplands. Areas generally are elongated and are 4 to 30 acres in size. Slopes range from 50 to 200 feet long.

In a typical profile, the surface layer is dark brown loam about 3 inches thick. The subsurface layer is dark brown loam about 7 inches thick. The subsoil is yellowish brown, firm clay loam about 35 inches thick. The substratum to a depth of 60 inches is yellowish brown loam. In some areas the depth to the substratum is less than 40 inches.

Included with this soil in mapping are small areas of the Corydon-Rock outcrop complex on the lower slopes. Corydon soils are shallow. Also included are very narrow areas of colluvial soils in drainageways. Included areas make up about 3 to 10 percent of the unit.

Permeability is moderate in the Hickory soil, and available water capacity is high. Organic matter content is moderate in the surface layer. Surface runoff is very

rapid. The surface layer is dominantly medium acid. It is friable.

This soil is generally unsuited to cultivated crops because of a very severe hazard of erosion. It generally is unsuited to hay and is poorly suited to pasture. The slope severely hinders the use of most kinds of farm equipment. The major concern of management in pastured areas is overgrazing or grazing during wet periods. Grazing when the soil is wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

Most areas are used as woodland. This soil is well suited to trees. The major concerns of management are the severe hazard of erosion and the severe equipment limitation, which results from the steep and very steep slopes. Plant competition is moderate. Seedlings survive and grow well if competing vegetation and erosion are controlled. The competing trees and shrubs can be controlled by site preparation or by spraying, cutting, or girdling. If possible, logging roads should be built on the contour and trees planted on the contour. Special logging methods, such as yarding logs uphill with a cable, may be needed because ordinary crawler or rubber-tired tractors cannot operate safely on the very steep slopes. Excluding livestock helps to prevent deterioration of the woodland. Harvesting mature trees and fostering the growth of seed trees improve the woodland.

This soil generally is unsuitable for building site development and sanitary facilities because the slope is a severe limitation. Low strength and the slope are severe limitations on sites for local roads. Providing coarse grained subgrade or base material helps to prevent the damage caused by low strength. Building the roads on the contour and land shaping help to overcome the slope.

The capability subclass is VIIe; woodland suitability subclass 1r.

HID3—Hickory clay loam, 12 to 18 percent slopes, severely eroded. This strongly sloping, deep, well drained soil is on back slopes, side slopes, and toe slopes in the uplands. Areas generally are elongated and are 4 to 12 acres in size. Slopes range from 50 to 225 feet long.

In a typical profile, the surface layer is yellowish brown clay loam about 4 inches thick. The subsoil is yellowish brown, firm clay loam about 44 inches thick. The substratum to a depth of 60 inches is yellowish brown loam. In some areas the surface layer is loam.

Included with this soil in mapping are small areas of Cincinnati soils in similar positions on the landscape. These soils are more silty than the Hickory soil. Also included are narrow areas of colluvial soils in drainageways. Included soils make up about 3 to 10 percent of the unit.

Permeability is moderate in the Hickory soil, and available water capacity is high. Organic matter content is low because of the erosion. Surface runoff is very rapid. The surface layer is dominantly strongly acid. It is firm or friable and tends to be cloddy if tilled when excessively wet. The shrink-swell potential is moderate.

Most areas are used for pasture or hay. Some are used as woodland. A few are used for cultivated crops.

This soil is generally unsuited to cultivated crops because of a severe hazard of further erosion. It should be planted to small grain only to reestablish hay and pasture. Diversions, cover crops, and a conservation tillage system that leaves all or part of the crop residue on the surface help to prevent excessive soil loss.

This soil is suited to pasture and is poorly suited to hay because of the slope and the erosion. The major concern of management is overgrazing or grazing during wet periods. Grazing when the soil is wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is well suited to trees. The major concern of management is plant competition. Seedlings survive and grow well if competing vegetation and erosion are controlled. The competing trees and shrubs can be controlled by site preparation or by spraying, cutting, or girdling. If possible, logging roads should be built on the contour and trees planted on the contour. Excluding livestock helps to prevent deterioration of the woodland. Harvesting mature trees and fostering the growth of seed trees improve the woodland.

The slope and the shrink-swell potential are moderate limitations if this soil is used for building site development. Buildings should be designed to conform to the natural slope of the land. Reinforcing foundations, footings, and basement walls and backfilling with coarse material help to prevent the structural damage caused by shrinking and swelling. Diversion terraces and grassed waterways between lots help to control erosion. Restricting building site development to small areas, removing as little of the plant cover as possible, and revegetating as soon as possible after construction also help to control erosion. Sediment-settling basins help to control siltation.

Low strength is a severe limitation and the slope a moderate limitation if this soil is used as a site for local roads and streets. Providing coarse grained subgrade or base material helps to prevent the damage caused by low strength. Land shaping and building the roads on the contour help to overcome the slope.

The moderate permeability and the slope are moderate limitations if this soil is used as a septic tank absorption field. Land shaping and installing the distribution lines across the slope generally improve the

effectiveness of the field. Installing the absorption field in coarse fill material helps to overcome the moderate permeability. If these measures cannot overcome the limitations, an alternative site should be selected.

The capability subclass is VIe; woodland suitability subclass 1o.

Lb—Lobdell silt loam, frequently flooded. This nearly level, deep, moderately well drained soil is on broad swells and in swales on flood plains. It is frequently flooded for very brief periods in the winter and spring. Areas are narrow and irregular in shape. They are dominantly about 15 acres in size but range from 3 to 15 acres.

In a typical profile, the surface layer is dark brown silt loam about 8 inches thick. The subsoil is about 32 inches thick. It is brown, friable silt loam in the upper part and brown, mottled, friable loam in the lower part. The substratum to a depth of 60 inches is yellowish brown, mottled fine sandy loam. In some small areas it is calcareous or is coarse sand. In other areas the content of gravel in the surface layer and subsoil is 4 or 5 percent. In a few places bedrock is within a depth of 40 inches.

Included with this soil in mapping are small areas of the well drained Chagrin and somewhat poorly drained Orrville soils on the higher swells and in the lower swales. These soils make up about 13 percent of the unit.

The Lobdell soil is moderately permeable. It has a seasonal high water table at a depth of 2.0 to 3.5 feet in winter and early in spring. Available water capacity is high. Organic matter content is moderately low. Surface runoff is slow. The surface layer is dominantly neutral. It is friable and can be easily tilled throughout a moderate range in moisture content.

Most areas are used for cultivated crops. Some are used as woodland. A few are used for hay or pasture.

This soil is suited to corn and soybeans. The spring and winter flooding is the major hazard. Building levees helps to protect crops from floodwater. A supplemental drainage system is needed in the low lying areas. Green manure crops and a conservation tillage system that leaves all or part of the crop residue on the surface help to maintain good tilth and increase the organic matter content.

This soil is well suited to grasses and legumes for hay and pasture, but it is subject to flooding. Overgrazing or grazing when the soil is wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is well suited to trees. Plant competition is the main management concern. The competing trees and shrubs can be controlled by site preparation or by spraying, cutting, or girdling. Excluding livestock helps to prevent deterioration of the woodland. Harvesting mature trees and fostering the growth of seed trees improve the woodland.

This soil is generally unsuitable as a site for buildings and sanitary facilities because of the flooding and the wetness. The flooding and frost action are severe limitations on sites for roads. Constructing the roads on raised, well compacted fill material and providing adequate side ditches and culverts help to prevent the damage caused by flooding and frost action.

The capability subclass is IIIw; woodland suitability subclass 1o.

MeA—Martinsville loam, 0 to 2 percent slopes. This nearly level, deep, well drained soil is on broad outwash plains and kames. Areas are somewhat elliptical and are 5 to 15 acres in size. Slopes are 100 to 350 feet long.

In a typical profile, the surface layer is dark brown loam about 9 inches thick. The subsoil is about 46 inches thick. It is dark yellowish brown, firm silt loam in the upper part; dark brown, firm loam in the next part; and brown and dark yellowish brown, firm sandy loam in the lower part. The substratum to a depth of 70 inches is dark yellowish brown, stratified loamy sand and silt loam. In some areas the subsoil and substratum are more acid and are underlain by fossiliferous shale and limestone bedrock at a depth of 50 to 80 inches. In other small areas the subsoil and substratum contain more gravel. In a few small areas the soil is less stratified and contains less sand.

Permeability is moderate in the Martinsville soil, and available water capacity is high. Organic matter content is moderately low in the surface layer. Surface runoff is slow. The surface layer is dominantly slightly acid. It is friable and can be easily tilled throughout a fairly wide range in moisture content. The shrink-swell potential is moderate.

Most areas are used for cultivated crops. A few are used for hay or pasture.

This soil is well suited to corn, soybeans, and small grain. Cover crops and a conservation tillage system that leaves all or part of the crop residue on the surface help to maintain tilth and increase the organic matter content.

This soil is well suited to hay or pasture. Overgrazing or grazing when the soil is wet, however, causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is well suited to trees. Plant competition is the main concern of management. Seedlings survive and grow well if competing vegetation is controlled by site preparation or by spraying, cutting, or girdling. Excluding livestock helps to prevent deterioration of the woodland. Harvesting mature trees and fostering the growth of seed trees improve the woodland.

The shrink-swell potential is a moderate limitation if this soil is used as a site for buildings. Reinforcing foundations and footings and backfilling with coarse material, however, help to prevent the structural damage caused by shrinking and swelling. Low strength and frost action are moderate limitations on sites for local roads and streets. Providing coarse grained subgrade or base material, however, helps to prevent the damage caused by low strength and frost action. The soil has slight limitations as a septic tank absorption field.

The capability class is I; woodland suitability subclass 1o.

MeB2—Martinsville loam, 2 to 6 percent slopes, eroded. This gently sloping, deep, well drained soil is on summits, shoulder slopes, and back slopes on outwash plains and kames. Areas are irregular in shape and are 2 to 18 acres in size. Slopes are 50 to 200 feet long.

In a typical profile, the surface layer is dark brown loam about 7 inches thick. The subsoil is about 63 inches thick. It is yellowish brown. It is firm silty clay loam in the upper part, firm clay loam in the next part, and friable loam in the lower part. The substratum to a depth of 75 inches is yellowish brown, stratified fine sandy loam. In small severely eroded areas, the slope is more than 6 percent and the surface layer is clay loam. In some small areas the subsoil and substratum contain more gravel. In a few small areas the soil is less stratified and contains less sand.

Included with this soil in mapping are a few small, narrow areas of colluvial soils in drainageways. These soils make up about 6 to 8 percent of the unit.

Permeability is moderate in the Martinsville soil, and available water capacity is high. Organic matter content is moderately low in the surface layer. Surface runoff is medium. The surface layer is dominantly slightly acid. It is friable and can be easily tilled throughout a fairly wide range in moisture content. The shrink-swell potential is moderate.

Most areas are used for cultivated crops. Some are used for hay, pasture, orchards, or woodland.

This soil is well suited to corn, soybeans, and small grain. Measures that control erosion and runoff are needed if cultivated crops are grown. Examples are cover crops, a cropping sequence that includes grasses and legumes, a conservation tillage system that leaves all or part of the crop residue on the surface, and a combination of contour farming and grassed waterways. Cover crops also help to maintain tilth and increase the organic matter content.

Growing grasses and legumes for hay or pasture is effective in controlling wind and water erosion. Overgrazing or grazing when the soil is wet, however, causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

A few areas are used as orchards or are wooded with hardwoods. This soil is well suited to trees. Plant competition is the main concern of management. Seedlings survive and grow well if competing vegetation is controlled by site preparation or by spraying, cutting, or girdling. Excluding livestock helps to prevent deterioration of the woodland. Harvesting mature trees and fostering the growth of seed trees improve the woodland.

The shrink-swell potential is a moderate limitation if this soil is used as a site for buildings. Reinforcing foundations and footings and backfilling with coarse material, however, help to prevent the structural damage caused by shrinking and swelling. Frost action and low strength are moderate limitations on sites for local roads and streets. Providing coarse grained subgrade or base material, however, helps to prevent the damage caused by frost action and low strength. The soil has slight limitations as a septic tank absorption field.

The capability subclass is IIe; woodland suitability subclass 1o.

MmB2—Miami silt loam, 2 to 6 percent slopes, eroded. This gently sloping, deep, well drained soil is on summits, side slopes, shoulder slopes, and back slopes on glacial till plains in the uplands. Areas are irregular in shape and are 2 to 20 acres in size. Slopes are 50 to 200 feet long.

In a typical profile, the surface layer is brown silt loam about 7 inches thick. The subsoil is about 28 inches thick. It is brown, firm silty clay loam and clay loam in the upper part and yellowish brown, firm loam in the lower part. The substratum to a depth of 60 inches is pale brown loam. In small severely eroded areas, the surface layer is loam or clay loam. In some areas the surface layer and subsoil are less acid throughout. In some places the upper part of the soil is more gravelly. In other places the slope is more than 6 percent.

Included with this soil in mapping are a few small areas of the moderately well drained Williamstown and somewhat poorly drained Crosby soils on the slightly lower parts of the landscape and around drainageways. Also included, in small drainageways, are small areas of the poorly drained Cyclone soils and small areas of colluvial soils. Included soils make up 10 to 15 percent of the unit.

Permeability is moderate in the subsoil of the Miami soil and moderately slow in the substratum. Available water capacity is high. Organic matter content is moderately low in the surface layer. Surface runoff is medium. The surface layer is dominantly medium acid. It is friable and can be easily tilled throughout a fairly wide range in moisture content. The shrink-swell potential is moderate.

Most areas are used for cultivated crops. Some are used for hay, pasture, orchards, or woodland.

This soil is well suited to corn, soybeans, and small grain. Measures that help to control erosion and runoff are needed. Examples are cover crops, a cropping sequence that includes grasses and legumes, a conservation tillage system that leaves all or part of the crop residue on the surface, and a combination of contour farming and grassed waterways. Cover crops also help to maintain tilth and increase the organic matter content.

Growing grasses and legumes for hay and pasture is effective in controlling wind and water erosion. Overgrazing or grazing when the soil is wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

A few areas are used as orchards or are wooded with hardwoods. This soil is well suited to trees. Plant competition is the main concern of management. Seedlings survive and grow well if competing vegetation is controlled by site preparation or by spraying, cutting, or girdling. Excluding livestock helps to prevent deterioration of the woodland. Harvesting mature trees and fostering the growth of seed trees improve the woodland.

The shrink-swell potential is a moderate limitation if this soil is used as a site for buildings. Reinforcing foundations and footings and backfilling with coarse material, however, help to prevent the structural damage caused by shrinking and swelling. Low strength and frost action are moderate limitations on sites for local roads and streets. Providing coarse grained subgrade or base material, however, helps to prevent the damage caused by frost action and low strength.

The moderately slow permeability is a severe limitation if this soil is used as a septic tank absorption field. Enlarging the absorption field or installing the field in 2 or 3 feet of coarse fill material helps to overcome the moderately slow permeability.

The capability subclass is IIe; woodland suitability subclass 1o.

MmC2—Miami silt loam, 6 to 12 percent slopes, eroded. This moderately sloping, deep, well drained soil is on back slopes, shoulder slopes, and summits along drainageways and on side slopes along the larger stream valleys. Areas generally are long and narrow and are 2 to 20 acres in size. Slopes are 60 to 120 feet long.

In a typical profile, the surface layer is brown silt loam about 6 inches thick. The subsoil is about 28 inches thick. It is yellowish brown, firm loam in the upper part; strong brown, firm clay loam in the next part; and yellowish brown, firm loam in the lower part. The substratum to a depth of 60 inches is brown loam. In some small areas, dominantly on shoulder slopes, the soil is severely eroded. In other small areas the slope is more than 12 percent.

Included with this soil in mapping are small areas of the less sloping, moderately well drained Williamstown soils. Also included are colluvial soils in small drainageways. Included soils make up about 2 to 10 percent of the unit.

The Miami soil is moderately permeable in the subsoil and moderately slowly permeable in the substratum. Available water capacity is high. Organic matter content is moderate. Surface runoff is medium. The surface layer is dominantly medium acid. It is friable and can be tilled throughout a fairly wide range in moisture content. The shrink-swell potential is moderate.

Most areas are wooded with hardwoods. Others are used for hay and pasture. A few are used for cultivated crops.

This soil is suited to corn, soybeans, and small grain. Measures that control erosion and runoff are needed if cultivated crops are grown. Examples are cover crops, a cropping sequence that includes grasses and legumes, a conservation tillage system that leaves all or part of the crop residue on the surface, terraces, diversions, a combination of contour farming and grassed waterways, and grade stabilization structures. Cover crops also help to maintain tilth and increase the organic matter content.

This soil is well suited to grasses and legumes for hay and pasture. A cover of grasses and legumes is effective in controlling erosion. Overgrazing or grazing when the soil is wet, however, causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is suited to trees. Plant competition is the main concern of management. Seedlings survive and grow well if competing vegetation is controlled by site preparation or by spraying, cutting, or girdling. Excluding livestock helps to prevent deterioration of the woodland. Harvesting mature trees and fostering the growth of seed trees improve the woodland.

The slope and the shrink-swell potential are moderate limitations if this soil is used as a site for buildings. Reinforcing foundations and footings and backfilling with coarse material help to prevent the structural damage caused by shrinking and swelling. Buildings should be designed to conform to the natural slope of the land. The slope, low strength, and frost action are moderate limitations on sites for local roads and streets. Providing coarse grained subgrade or base material helps to prevent the damage caused by low strength and frost action. Land shaping and building the roads on the contour help to overcome the slope.

The moderately slow permeability is a severe limitation and the slope a moderate limitation if this soil is used as a septic tank absorption field. Enlarging the absorption field or installing the field in 2 or 3 feet of coarse fill

material helps to overcome the moderately slow permeability. Land shaping and installing the distribution lines across the slope generally improve the effectiveness of the field.

The capability subclass is IIIe; woodland suitability subclass 1o.

MmD2—Miami silt loam, 12 to 18 percent slopes, eroded. This strongly sloping, deep, well drained soil is on side slopes, back slopes, toe slopes, and shoulder slopes in the uplands adjacent to the larger stream valleys. Areas generally are narrow and irregular in shape and are 2 to 10 acres in size. Slopes are 30 to 100 feet long.

In a typical profile, the surface layer is very dark grayish brown silt loam about 5 inches thick. The subsurface layer is yellowish brown silt loam about 2 inches thick. The subsoil is dark yellowish brown, firm clay loam about 18 inches thick. The substratum to a depth of 60 inches is pale brown loam. In some small areas on shoulder slopes, it is at a depth of 15 to 24 inches. The slope is more than 18 percent in some areas on nose slopes.

Included with this soil in mapping are a few areas of Hennepin soils on the steeper side slopes. Also included are colluvial soils in drainageways. Included soils make up about 2 to 10 percent of the unit.

Permeability is moderate in the subsoil of the Miami soil and moderately slow in the substratum. Available water capacity is high. Organic matter content is moderate. Surface runoff is rapid. The surface layer is friable. It is dominantly medium acid. The shrink-swell potential is moderate.

Most areas are used as woodland. Some are used for grasses and legumes for forage or pasture. A few are used for cultivated crops.

This soil is poorly suited to corn and soybeans because of a very severe hazard of erosion. It should be planted to small grain only to reestablish hay and pasture. A conservation tillage system that leaves all or part of the crop residue on the surface, a cropping sequence that includes grasses and legumes, and a combination of diversions and grassed waterways help to control erosion and runoff.

This soil is suited to grasses and legumes for hay and pasture. Farm machinery cannot easily cross drainageways in some areas. Overgrazing or grazing when the soil is wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

A few areas are wooded with hardwoods. This soil is well suited to trees. Plant competition is the main concern of management. Seedlings survive and grow well if competing vegetation is controlled by site preparation or by spraying, cutting, or girdling. Excluding livestock helps to prevent deterioration of the woodland. Harvesting mature trees and fostering the growth of seed trees improve the woodland.

The slope is a severe limitation and the shrink-swell potential a moderate limitation if this soil is used as a site for buildings. Buildings should be designed to conform to the natural slope of the land. Land shaping and installing retaining walls also help to overcome the slope. Reinforcing foundations, footings, and basement walls and backfilling with coarse material help to prevent the structural damage caused by shrinking and swelling. Diversion terraces and grassed waterways between lots help to control erosion. Removing as little of the plant cover as possible also helps to control erosion. Sediment-settling basins help to control siltation.

The slope is a severe limitation and frost action and low strength moderate limitations if this soil is used as a site for local roads and streets. Land shaping and building the roads on the contour help to overcome the slope. Providing coarse grained subgrade or base material helps to prevent the damage caused by low strength and frost action.

The moderately slow permeability in the substratum and the slope are severe limitations if this soil is used as a septic tank absorption field. Enlarging the absorption field or installing the field in 2 or 3 feet of coarse fill material helps to overcome the moderately slow permeability. Land shaping and installing the distribution lines across the slope generally improve the effectiveness of the field.

The capability subclass is IVe; woodland suitability subclass 1o.

MoC3—Miami clay loam, 6 to 12 percent slopes, severely eroded. This moderately sloping, deep, well drained soil is on back slopes, shoulder slopes, and summits along drainageways and on side slopes along the larger stream valleys. Areas generally are narrow and long and are 3 to 20 acres in size. Slopes are 60 to 120 feet long.

In a typical profile, the surface layer is brown clay loam about 6 inches thick. The subsoil is yellowish brown, firm clay loam about 20 inches thick. The substratum to a depth of 60 inches is light yellowish brown loam. In places calcareous till is exposed. In some areas on the shoulder slopes, the substratum is at a depth of 6 to 24 inches. In other areas the slope is more than 12 percent.

Included with this soil in mapping are small areas of Martinsville soils in similar positions on the landscape. Also included are colluvial soils in small drainageways. Included soils make up about 3 to 10 percent of the unit.

Permeability is moderate in the subsoil of the Miami soil and moderately slow in the substratum. Available water capacity is high. Organic matter content is low because of the loss of surface soil through erosion. Surface runoff is rapid. The surface layer is dominantly

medium acid. It is friable, but clods tend to form if the soil is not tilled within the proper range in moisture content. The shrink-swell potential is moderate.

Most areas are used for cultivated crops. Others are used for hay and pasture. Some are used as woodland.

This soil is poorly suited to corn, soybeans, and small grain because of a severe hazard of further erosion. Cover crops, a cropping sequence that includes grasses and legumes, a conservation tillage system that leaves all or part of the crop residue on the surface (fig. 10), terraces, diversions, a combination of contour farming and grassed waterways, and grade stabilization structures help to control runoff and prevent excessive soil loss. Generally, more than one of these measures is needed. Cover crops also help to maintain tilth and increase the organic matter content.

This soil is suited to grasses and legumes for hay and pasture (fig. 11). A cover of grasses and legumes is effective in controlling erosion. Overgrazing or grazing when the soil is wet, however, causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

A few areas are wooded with hardwoods. This soil is well suited to trees. Plant competition is the main concern of management. Seedlings survive and grow well if competing vegetation is controlled by site preparation or by spraying, cutting, or girdling. Excluding livestock helps to prevent deterioration of the woodland. Harvesting mature trees and fostering the growth of seed trees improve the woodland.

Figure 10.—No-till corn on Miami clay loam, 6 to 12 percent slopes, severely eroded.

Figure 11.—Hay on Miami clay loam, 6 to 12 percent slopes, severely eroded.

The slope and the shrink-swell potential are moderate limitations if this soil is used as a site for buildings. Reinforcing foundations and footings and backfilling with coarse material help to prevent the structural damage caused by shrinking and swelling. Buildings should be designed to conform to the natural slope of the land. Diversion terraces and grassed waterways between lots help to control erosion. Restricting building site development to small areas, removing as little of the plant cover as possible, and revegetating as soon as possible after construction also help to control erosion. Sediment-settling basins help to control siltation.

The slope, low strength, and frost action are moderate limitations if this soil is used as a site for local roads and streets. Providing coarse grained subgrade or base material helps to prevent the damage caused by low strength and frost action. Land shaping and building the roads on the contour help to overcome the slope.

The moderately slow permeability in the substratum is a severe limitation if this soil is used as a septic tank absorption field. Enlarging the absorption field or installing the field in 2 or 3 feet of coarse fill material help to overcome the moderately slow permeability. Land shaping and installing the distribution lines across the slope generally improve the effectiveness of the field.

The capability subclass is IVe; woodland suitability subclass 1o.

MoD3—Miami clay loam, 12 to 18 percent slopes, severely eroded. This strongly sloping, deep, well drained soil is on side slopes, back slopes, toe slopes, and shoulder slopes adjacent to the larger stream valleys. Areas generally are narrow and irregular in

shape and are 2 to 10 acres in size. Slopes are 30 to 100 feet long.

In a typical profile, the surface layer is brown clay loam about 5 inches thick. The subsoil is brown, firm clay loam about 19 inches thick. The substratum to a depth of 60 inches is pale brown and yellowish brown loam. In places calcareous till is exposed. In some areas the substratum is at a depth of 15 to 24 inches. In some areas on nose slopes, the soil is less severely eroded and the slope is less than 12 percent.

Included with this soil in mapping are a few areas of the steeper Hennepin soils on the upper side slopes and colluvial soils in drainageways. These soils make up about 2 to 8 percent of the unit.

Permeability is moderate in the subsoil of the Miami soil and moderately slow in the substratum. Available water capacity is high. Organic matter content is low because of the loss of surface soil through erosion. Surface runoff is very rapid in cultivated areas. The surface layer is dominantly medium acid. It is friable, but clods tend to form if the soil is not tilled within the proper moisture content. The shrink-swell potential is moderate.

Most areas are used for grasses and legumes for forage or pasture. Some are used as woodland. Some are used for cultivated crops.

This soil is generally unsuited to corn and soybeans because of a very severe hazard of further erosion. It should be planted to small grain only to reestablish hay and pasture. A conservation tillage system that leaves all or part of the crop residue on the surface, a combination of diversions and grassed waterways, and a cropping sequence that includes grasses and legumes help to control erosion and runoff.

This soil is suited to grasses and legumes for hay and pasture. Farm machinery cannot easily cross gullies in some areas. Overgrazing or grazing when the soil is wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

A few areas are wooded with hardwoods. This soil is well suited to trees. Plant competition is the main concern of management. Seedlings survive and grow well if competing vegetation is controlled by site preparation or by spraying, cutting, or girdling. Excluding livestock helps to prevent deterioration of the woodland. Harvesting mature trees and fostering the growth of seed trees improve the woodland.

The slope is a severe limitation and the shrink-swell potential a moderate limitation if this soil is used as a site for buildings. Buildings should be designed to conform to the natural slope of the land. Land shaping and installing retaining walls also help to overcome the slope. Reinforcing foundations, footings, and basement walls and backfilling with coarse material help to prevent the structural damage caused by shrinking and swelling. Diversion terraces and grassed waterways between lots help to control erosion. Removing as little of the plant cover as possible and revegetating as soon as possible after construction also help to control erosion. Sediment-settling basins help to control siltation.

The slope is a severe limitation and low strength and frost action moderate limitations if this soil is used as a site for local roads and streets. Land shaping and building the roads on the contour help to overcome the slope. Providing coarse grained subgrade or base material helps to prevent the damage caused by low strength and frost action.

The moderately slow permeability in the substratum and the slope are severe limitations if this soil is used as a site for septic tank absorption fields. Enlarging the absorption field or installing the field in 2 or 3 feet of coarse fill material helps to overcome the moderately slow permeability. Land shaping and installing the distribution lines across the slope generally improve the effectiveness of the field.

The capability subclass is VIe; woodland suitability subclass 1o.

Mr—Milford silty clay. This nearly level, deep, poorly drained and very poorly drained soil is in broad swales and depressions on lake plains. It is frequently ponded for long periods by surface runoff from the adjacent higher lying areas. Areas are circular and are 5 to 25 acres in size.

In a typical profile, the surface layer is black, mottled silty clay about 10 inches thick. The subsurface layer is very dark gray, mottled silty clay loam about 4 inches thick. The subsoil is about 33 inches of very dark gray and gray, mottled, firm silty clay and silty clay loam. The substratum to a depth of 60 inches is gray, mottled, stratified silty clay loam, silty clay, and silt loam. In some areas the soil is underlain by glacial till.

This soil is slowly permeable. It has a seasonal high water table near or above the surface part of the year, and depressional areas are ponded during the spring. Available water capacity is high. Organic matter content is high in the surface layer. Surface runoff is very slow or ponded. If the soil is tilled when wet, large clods form. They become very firm when they dry. As a result of the clods, preparing a seedbed is difficult.

Most areas are used for cultivated crops. A few are used for hay.

If adequately drained, this soil is well suited to corn, soybeans, and small grain. If drained and otherwise well managed, it is suited to intensive row cropping. The wetness is the main limitation. Ponding and frost heaving damage small grain crops during some years. Obtaining suitable outlets for a subsurface drainage system is difficult. Excess water can be removed by subsurface drains, surface drains, open ditches, or pumps or by a combination of these. A conservation tillage system that leaves all or part of the crop residue on the surface and

tilling the soil within the proper range in moisture content help to maintain tilth and increase the organic matter content.

This soil is suited to shallow rooted grasses and legumes for hay or pasture. It is poorly suited, however, to most deep rooted legumes because of the seasonal high water table and the ponding. A drainage system is needed. Overgrazing or grazing when the soil is wet causes surface compaction and poor tilth. Overgrazing also reduces the plant density and plant hardiness. Proper stocking rates, rotation grazing, timely deferment of grazing, and restricted use during wet periods help to prevent surface compaction and maintain good tilth and plant density.

This soil is suited to trees. The main concerns of management are the equipment limitation, plant competition, seedling mortality, and the windthrow hazard. Trees should be harvested and logged during dry periods or during periods when the ground is frozen. Water tolerant species should be selected for planting. Seedlings survive and grow well if competing vegetation is controlled by cutting, spraying, or girdling. Harvesting methods that do not isolate the remaining trees or leave them widely spaced help to prevent windthrow.

This soil is generally unsuitable as a site for buildings and sanitary facilities because the ponding is a severe limitation. Frost action, low strength, and ponding are severe limitations on sites for roads. Providing coarse grained subgrade or base material helps to prevent the damage caused by low strength. Constructing the roads on raised, well compacted fill material and providing adequate side ditches and culverts help to prevent the damage caused by ponding and frost action.

The capability subclass is IIw; woodland suitability subclass 3w.

Ms—Millsdale silty clay loam. This nearly level, moderately deep, very poorly drained soil is on broad flats and in drainageways and slight depressions on till plains. It is frequently ponded by surface runoff from the adjacent higher lying areas. Areas are irregular in shape and are 5 to 25 acres in size.

In a typical profile, the surface layer is very dark gray silty clay loam about 9 inches thick. The subsoil is about 27 inches of mottled, firm clay loam. It is very dark gray in the upper part, gray in the next part, and yellowish brown in the lower part. The lower 3 inches of the subsoil formed in limestone residuum. Limestone bedrock is at a depth of about 36 inches. In a few small areas the bedrock is at a depth of 40 to 60 inches or within a depth of 20 inches.

Included with this soil in mapping are small areas of the poorly drained Cyclone soils near the perimeter of depressions. These soils make up about 9 percent of the unit.

The Millsdale soil is moderately slowly permeable. It has a seasonal high water table near or above the surface part of the year, and some depressional areas are ponded early in spring. Available water capacity is moderate. Organic matter content is high in the surface layer. Surface runoff is very slow or ponded. The surface layer can be easily tilled only within the proper range in moisture content. If the soil is tilled when too wet, large clods form. They become very firm when they dry. As a result of the clods, preparing a seedbed is difficult. The shrink-swell potential is high.

Most areas are used for cultivated crops. A few are used for hay, pasture, or woodland.

If adequately drained, this soil is suited to corn, soybeans, and small grain. If drained and otherwise well managed, it is suited to intensive row cropping. The wetness is the main limitation. Also, the bedrock at a moderate depth limits the available water capacity in dry years. Ponding and frost heaving damage small grain crops during some years. Installation of a subsurface drainage system is severely limited by the bedrock within a depth of 40 inches. Excess water can be removed by subsurface drains, surface drains, open ditches, or pumps or by a combination of these. In some areas the bedrock should be blasted before drains are installed. A conservation tillage system that leaves all or part of the crop residue on the surface helps to maintain tilth and increases the organic matter content.

This soil is suited to shallow rooted grasses and legumes for hay or pasture. It is poorly suited, however, to many deep rooted legumes because of the seasonal high water table and the ponding. A drainage system is needed. Overgrazing or grazing when the soil is wet causes surface compaction and poor tilth. Overgrazing also reduces the plant density and plant hardiness. Proper stocking rates, rotation grazing, timely deferment of grazing, and restricted use during wet periods help to prevent surface compaction and help to maintain good tilth and plant density.

This soil is suited to trees. The main concerns of management are the equipment limitation, plant competition, seedling mortality, and the windthrow hazard. Trees should be harvested and logged during dry periods or during periods when the ground is frozen. Water tolerant species should be selected for planting. Seedlings survive and grow well if competing vegetation is controlled by cutting, spraying, or girdling. Excluding livestock helps to prevent deterioration of the woodland. Harvesting mature trees and fostering the growth of seed trees improve the woodland.

This soil is generally unsuitable as a site for buildings and sanitary facilities because of the shrinking and swelling, the depth to bedrock, and the ponding. The ponding, low strength, and frost action are severe limitations on sites for local roads. Providing coarse grained subgrade or base material helps to prevent the damage caused by low strength. Constructing the roads on raised, well compacted fill material and providing

adequate side ditches and culverts help to prevent the damage caused by ponding and frost action.

The capability subclass is IIIw; woodland suitability subclass 2w.

MtA—Milton silt loam, 0 to 2 percent slopes. This nearly level, moderately deep, well drained soil is on swells and rises on till plains. Areas are elongated or irregular in shape. They are dominantly about 25 acres in size but range from 5 to 40 acres. Slopes are 75 to 300 feet long.

In a typical profile, the surface layer is dark brown silt loam about 8 inches thick. The subsoil is about 24 inches thick. It is brown, firm silty clay loam in the upper part; dark yellowish brown, firm clay loam in the next part; and dark brown, firm silty clay in the lower part. The substratum to a depth of about 34 inches is light gray silty clay. Limestone bedrock is at a depth of about 34 inches. In some areas the loess is 16 to 24 inches thick. In other areas the substratum is silt loam or silt weathered from limestone bedrock. In some places the bedrock is at a depth of 40 to 60 inches or within a depth of 20 inches. In other places the lower part of the subsoil is less clayey.

Included with this soil in mapping are small areas of Russell and Miami soils and the moderately well drained Xenia soils on similar parts of the landscape. Russell and Miami soils are less clayey than the Milton soil. Included soils make up about 5 to 15 percent of the unit.

Permeability is moderately slow in the Milton soil, and available water capacity is moderate. Organic matter content is moderate in the surface layer. Surface runoff is slow. The surface layer is dominantly slightly acid. It is friable and can be easily tilled throughout a fairly wide range in moisture content. The shrink-swell potential is moderate.

Most areas are used for cultivated crops. A few are used for hay or pasture.

This soil is suited to corn, soybeans, and small grain. Droughtiness is the main management concern. It can be overcome, however, by planting early maturing crops. Cover crops and a conservation tillage system that leaves all or part of the crop residue on the surface help to maintain tilth and increase the organic matter content.

This soil is suited to hay or pasture. The major concern of management is overgrazing or grazing when the soil is wet, which causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is well suited to trees. Plant competition is the main concern of management. Seedlings survive and grow well if competing vegetation is controlled by site preparation or by spraying, cutting, or girdling. Excluding livestock helps to prevent deterioration of the woodland. Harvesting mature trees and fostering the growth of seed trees improve the woodland.

The depth to bedrock is a severe limitation if this soil is used as a site for dwellings with basements. The depth to bedrock and the shrink-swell potential are moderate limitations on sites for dwellings without basements. Reinforcing foundations and footings and backfilling with coarse material help to prevent the structural damage caused by shrinking and swelling. Low strength is a severe limitation on sites for local roads and streets. Providing coarse grained subgrade or base material, however, helps to prevent the damage caused by low strength.

The depth to bedrock and the moderately slow permeability are severe limitations if this soil is used as a septic tank absorption field. Excavating the moderately slowly permeable material and replacing it with more permeable material help to overcome the moderately slow permeability. In some areas the bedrock should be blasted before the absorption field is installed.

The capability subclass is IIs; woodland suitability subclass 2o.

MtB2—Milton silt loam, 2 to 6 percent slopes, eroded. This gently sloping, moderately deep, well drained soil is on swells and rises on till plains. Areas are long or irregular in shape. They are dominantly about 25 acres in size but range from 5 to 40 acres. Slopes are 50 to 175 feet long.

In a typical profile, the surface layer is dark brown silt loam about 11 inches thick. The subsoil is about 22 inches thick. It is yellowish brown, firm silt loam in the upper part; dark yellowish brown, firm clay loam in the next part; and dark brown, firm clay in the lower part. The substratum to a depth of about 34 inches is light gray silty clay loam. Limestone bedrock is at a depth of about 34 inches. In some places the loess is 16 to 25 inches thick. In other places the substratum is silt loam or silt about 7 inches thick and weathered from limestone bedrock. In some areas the bedrock is at a depth of 40 to 60 inches or within a depth of 20 inches. In a few areas the lower part of the subsoil contains less clay. In other areas the slope is more than 6 percent.

Included with this soil in mapping are small areas of Russell and Miami soils and the moderately well drained Xenia soils in similar positions on the landscape. Russell and Miami soils are less clayey than the Milton soil. Included soils make up about 4 to 15 percent of the unit.

Permeability is moderately slow in the Milton soil, and available water capacity is moderate. Organic matter content is moderate in the surface layer. Surface runoff is medium. The surface layer is dominantly neutral. It is friable and can be easily tilled throughout a fairly wide range in moisture content. The shrink-swell potential is moderate.

Most areas are used for cultivated crops. A few are used for hay or pasture.

This soil is suited to corn, soybeans, and small grain. Measures that help to control erosion and runoff are needed if cultivated crops are grown. Examples are a cropping sequence that includes grasses and legumes and a combination of a conservation tillage system that leaves all or part of the crop residue on the surface and grassed waterways. Planting crops early and planting early maturing crops help to overcome the droughtiness caused by the moderate available water capacity.

This soil is suited to hay or pasture. The major concern of management is overgrazing or grazing when the soil is too wet, which causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is well suited to trees. Plant competition is the main concern of management. Seedlings survive and grow well if competing vegetation is controlled by site preparation or by spraying, cutting, or girdling. Excluding livestock helps to prevent deterioration of the woodland. Harvesting mature trees and fostering the growth of seed trees improve the woodland.

The depth to bedrock is a severe limitation if this soil is used as a site for dwellings with basements. The depth to bedrock and the shrink-swell potential are moderate limitations on sites for dwellings without basements. Reinforcing foundations and footings and backfilling with coarse material help to prevent the structural damage caused by shrinking and swelling. Low strength is a severe limitation on sites for local roads and streets. Providing coarse grained subgrade or base material, however, helps to overcome this limitation.

The depth to bedrock and the moderately slow permeability are severe limitations if this soil is used as a septic tank absorption field. Excavating the moderately slowly permeable material and replacing it with more permeable material help to overcome the moderately slow permeability. In some areas the bedrock should be blasted before the absorption field is installed.

The capability subclass is IIe; woodland suitability subclass 2o.

My—Montgomery silty clay, gravelly substratum. This nearly level, deep, very poorly drained soil is in large, elongated swales and depressions on outwash terraces. Areas are dominantly about 100 acres in size but range from 50 to 150 acres.

In a typical profile, the surface soil is very dark gray silty clay about 14 inches thick. The subsoil is about 24 inches of dark gray and gray, firm silty clay and silty clay loam. The substratum to a depth of 60 inches is stratified dark gray silt loam and gray very gravelly loam. In some areas the depth to the substratum is 60 to 80 inches. In other areas the content of organic matter in the surface layer is higher.

Included with this soil in mapping are a few small circular areas of somewhat poorly drained soils on the higher swells. These soils are in areas 10 to 50 feet across. They make up about 2 to 5 percent of the unit.

The Montgomery soil is slowly permeable in the subsoil and moderately rapidly permeable or rapidly permeable in the substratum. It has a seasonal high water table near or above the surface and is ponded early in spring. Available water capacity is high. Organic matter content is high in the surface layer. Surface runoff is very slow or ponded. The surface layer can be tilled only within the proper range in moisture content. If the soil is tilled when wet, large clods form. They become very firm when they dry. As a result of the clods, preparing a seedbed is difficult. The shrink-swell potential is high.

All areas are used for cultivated crops. If adequately drained, this soil is well suited to corn, soybeans, and small grain. If drained and otherwise well managed, it is suited to intensive row cropping. The wetness is the main limitation. Ponding and frost heaving damage small grain crops during some years. Excess water can be removed by open ditches, subsurface drains, surface drains, or pumps or by a combination of these. A conservation tillage system that leaves all or part of the crop residue on the surface helps to maintain tilth and increases the organic matter content.

This soil is well suited to shallow rooted grasses and legumes for hay or pasture. It is poorly suited, however, to many deep rooted legumes because of the seasonal high water table and the ponding. A drainage system is needed. Overgrazing or grazing when the soil is wet causes surface compaction and poor tilth. Overgrazing also reduces the plant density and plant hardiness. Proper stocking rates, rotation grazing, timely deferment of grazing, and restricted use during wet periods help to prevent surface compaction and help to maintain good tilth and plant density.

This soil is well suited to trees. The main concerns of management are the equipment limitation, seedling mortality, plant competition, and the windthrow hazard. Harvesting or logging during dry periods or during periods when the ground is frozen helps to overcome the equipment limitation. Water tolerant species should be selected for planting. Seedlings survive and grow well if competing vegetation is controlled by cutting, spraying, or girdling. Excluding livestock helps to prevent deterioration of the woodland. Harvesting mature trees and fostering the growth of seed trees improve the woodland.

This soil generally is unsuitable as a site for buildings because the shrink-swell potential and the ponding are severe limitations. It generally is unsuitable as a site for sanitary facilities because of the slow permeability and the ponding. Frost action, low strength, and ponding are severe limitations on sites for local roads. Providing coarse grained subgrade or base material helps to

prevent the damage caused by low strength. Constructing the roads on raised, well compacted fill material and providing adequate side ditches and culverts help to prevent the damage caused by ponding and frost action.

The capability subclass is IVw; woodland suitability subclass 2w.

OcA—Ockley silt loam, 0 to 2 percent slopes. This nearly level, deep, well drained soil is on outwash terraces and kames. Areas are irregular in shape. They are dominantly about 10 acres in size but range from 2 to 30 acres. Slopes are 50 to 400 feet long.

In a typical profile, the surface layer is brown silt loam about 7 inches thick. The subsoil is about 38 inches thick. It is yellowish brown, firm silt loam in the upper part; dark yellowish brown, firm loam and gravelly sandy clay loam in the next part; and dark reddish brown, friable gravelly sandy loam in the lower part. The substratum to a depth of 60 inches is yellowish brown very gravelly coarse sand that has lenses of coarse sand. In some areas the upper 20 to 30 inches is silt loam or silty clay loam. In other areas the content of coarse chert fragments is more than 15 percent in the surface layer and the upper part of the subsoil. In some places the substratum is stratified loam and sand. In a few places bedrock is within a depth of 40 inches. In other places the depth to the substratum is less than 40 inches.

Permeability is moderate in the surface layer and subsoil and very rapid in the substratum. Available water capacity is high. Organic matter content is moderately low. Surface runoff is slow. The surface layer is dominantly medium acid. It is friable and can be easily tilled throughout a fairly wide range in moisture content. The shrink-swell potential is moderate.

Most areas are used for cultivated crops. Some are used for hay or pasture. A few are wooded with hardwoods.

This soil is well suited to corn, soybeans, and small grain. Cover crops and a conservation tillage system that leaves a protective amount of crop residue on the surface help to maintain tilth and the organic matter content. The soil may become droughty in years when rainfall is not regularly available during the growing season.

This soil is well suited to hay and pasture. The major concern of management is overgrazing or grazing when the soil is wet, which causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is well suited to trees. Plant competition is the main concern of management. Seedlings survive and grow well if competing vegetation is controlled by site preparation or by spraying, cutting, or girdling. Excluding livestock helps to prevent deterioration of the woodland. Harvesting mature trees and fostering the growth of seed trees improve the woodland.

The shrink-swell potential is a moderate limitation if this soil is used as a site for buildings. Reinforcing foundations and footings and backfilling with coarse material, however, help to prevent the damage caused by shrinking and swelling. Low strength is a severe limitation on sites for local roads and streets. Providing coarse grained subgrade or base material, however, helps to prevent the damage caused by low strength. The soil has slight limitations as a septic tank absorption field.

The capability class is I; woodland suitability subclass 1o.

OcB—Ockley silt loam, 2 to 6 percent slopes. This gently sloping, deep, well drained soil is on outwash plains, terraces, and kames. Areas are irregular in shape and are 10 to 30 acres in size. Slopes are 50 to 200 feet long.

In a typical profile, the surface layer is dark grayish brown silt loam about 10 inches thick. The subsoil is about 34 inches thick. It is brown, firm loam in the upper part and dark brown, firm gravelly sandy clay loam and gravelly sandy loam in the lower part. The substratum to a depth of 60 inches is stratified light brownish gray very gravelly loamy sand that has lenses of coarse sand. In some areas the depth to the substratum is 60 to 75 inches or less than 40 inches. In other areas the upper part of the subsoil is silt loam or silty clay loam and is 20 to 36 inches thick. In some places the substratum is stratified loam and sand. In a few places bedrock is within a depth of 40 inches.

Permeability is moderate in the surface layer and subsoil and very rapid in the substratum. Available water capacity is high. Organic matter content is moderately low in the surface layer. Surface runoff is medium. The surface layer is dominantly slightly acid. It is friable and can be easily tilled throughout a fairly wide range in moisture content. The shrink-swell potential is moderate.

Most areas are used for cultivated crops. Some are used for hay and pasture. A few are wooded with hardwoods.

This soil is well suited to corn, soybeans, and small grain. Measures that control erosion and runoff are needed. Examples are cover crops, a cropping sequence that includes grasses and legumes, a conservation tillage system that leaves all or part of the crop residue on the surface, a combination of contour farming and grassed waterways, and grade stabilization structures. Cover crops also help to maintain tilth and increase the organic matter content. The soil may become droughty in years when rainfall is not regularly available during the growing season.

This soil is well suited to hay and pasture. A cover of grasses and legumes is effective in controlling wind and

water erosion. Overgrazing or grazing when the soil is wet, however, causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is well suited to trees. Plant competition is the main concern of management. Seedlings survive and grow well if competing vegetation is controlled by site preparation or by spraying, cutting, or girdling. Excluding livestock helps to prevent deterioration of the woodland. Harvesting mature trees and fostering the growth of seed trees improve the woodland.

The shrink-swell potential is a moderate limitation if this soil is used as a site for buildings. Reinforcing foundations and footings and backfilling with coarse material, however, help to prevent the damage caused by shrinking and swelling. Low strength is a severe limitation on sites for local roads and streets. Providing coarse grained subgrade or base material, however, helps to prevent the damage caused by low strength. The limitations are slight if the soil is used as a septic tank absorption field.

The capability subclass is IIe; woodland suitability subclass 1o.

Or—Orrville silt loam, frequently flooded. This nearly level, deep, somewhat poorly drained soil is in narrow stream valleys and on slightly concave slopes near the streams on the larger flood plains. It is frequently flooded for very brief periods in the winter and spring. Areas are irregular in shape. They are dominantly about 10 acres in size but range from 3 to 20 acres.

In a typical profile, the surface soil is dark grayish brown silt loam about 10 inches thick. The subsoil is brown, yellowish brown, and light brownish gray, mottled, firm silt loam about 30 inches thick. The substratum to a depth of 60 inches is yellowish brown, mottled loam. In some small areas it is calcareous. In some places it contains less sand. In other places the content of gravel in the surface soil and subsoil is 2 or 3 percent. In a few places bedrock is at a depth of 20 to 60 inches.

Included with this soil in mapping are small scattered areas of the well drained Chagrin, moderately well drained Lobdell, and very poorly drained Sloan soils on flood plains. These soils make up about 4 to 15 percent of the unit.

The Orrville soil is moderately permeable. It has a seasonal high water table at a depth of 1.0 to 2.5 feet. Available water capacity is high. Organic matter content is moderately low in the surface layer. Surface runoff is slow. The surface layer is dominantly neutral. It is friable and can be easily tilled throughout a moderate range in moisture content.

Most areas are used for cultivated crops. Some are used as woodland. A few are used for hay or pasture.

The soil is suited to corn and soybeans and to small grain other than wheat. Spring and winter flooding is the major hazard, and the wetness is the major limitation. Building levees helps to protect crops from floodwater. Supplemental drainage is needed in low lying areas. Green manure crops and a conservation tillage system that leaves all or part of the crop residue on the surface help to maintain good tilth and increase the organic matter content.

This soil is well suited to grasses and water tolerant legumes for hay and pasture, but it is subject to flooding. It is poorly suited to many deep rooted legumes because of the seasonal high water table. Overgrazing or grazing when the soil is wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is well suited to trees. Plant competition is moderate. Water tolerant species should be selected for planting. The competing trees and shrubs can be controlled by site preparation or by spraying, cutting, or girdling. Excluding livestock helps to prevent deterioration of the woodland. Harvesting mature trees and fostering the growth of seed trees improve the woodland.

This soil generally is unsuitable as a site for buildings and sanitary facilities because the flooding and the wetness are severe limitations. Flooding and frost action are severe limitations on sites for local roads. Constructing the roads on raised, well compacted fill material and providing adequate side ditches and culverts help to prevent the damage caused by flooding and frost action.

The capability subclass is IIw; woodland suitability subclass 2o.

RoG—Rodman gravelly sandy loam, 35 to 60 percent slopes. This very steep, excessively drained soil is on the sides of outwash terraces adjacent to the bottom land along rivers and streams. It is shallow to very gravelly coarse sand. Areas are long and narrow. They are dominantly about 15 acres in size but range from 2 to 60 acres. Slopes are about 100 to 250 feet long.

In a typical profile, the surface layer is very dark grayish brown gravelly sandy loam about 8 inches thick. The subsoil is dark brown, very friable very gravelly sandy loam about 5 inches thick. The substratum to a depth of 60 inches is dark brown very gravelly coarse sand. In some areas the soil is underlain by glacial till. In other areas the depth to the substratum is more than 15 inches.

Permeability is very rapid in the Rodman soil, and available water capacity is low. Organic matter content is high in the surface layer. Surface runoff is very rapid. The surface layer is dominantly neutral. It is friable and

can be easily tilled throughout a wide range in moisture content.

Most areas are wooded with hardwoods. Some are used for pasture. Very few are used for cultivated crops.

This soil is not suited to corn, soybeans, small grain, or hay because of the slope. It is poorly suited to pasture. A cover of grasses and legumes is effective in controlling erosion. Overgrazing or grazing when the soil is wet, however, causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during dry periods help to keep the pasture and the soil in good condition.

This soil is suited to trees. The equipment limitation, seedling mortality, and the erosion hazard are the main concerns of management. Because of the seedling mortality, replanting commonly is needed. Once established, the seedlings survive and grow well only if erosion is controlled. Special logging methods, such as yarding logs uphill with a cable, may be needed because rubber-tired skidders and ordinary crawler tractors cannot operate safely on these very steep slopes. The competing trees and shrubs can be controlled or removed by site preparation or by spraying, cutting, or girdling. Excluding livestock helps to prevent deterioration of the woodland. Harvesting mature trees and fostering the growth of seed trees improve the woodland.

This soil generally is unsuitable as a site for buildings, local roads and streets, and sanitary facilities, mainly because the very steep slope is a severe limitation. The poor filtering capacity of the underlying very gravelly coarse sand also is a severe limitation on sites for septic tank absorption fields. It may result in the pollution of ground water.

The capability subclass is VIIs; woodland suitability subclass 3s.

RsB2—Rossmoyne silt loam, 2 to 6 percent slopes, eroded. This gently sloping, deep, moderately well drained soil is on shoulder slopes, side slopes, and back slopes. It has a fragipan (fig. 12). Areas are irregular in shape. They are dominantly about 10 acres in size but range from 3 to 20 acres. Slopes are 50 to 150 feet long.

In a typical profile, the surface layer is brown silt loam about 7 inches thick. The subsoil to a depth of about 80 inches is yellowish brown. It is mottled, firm silt loam in the upper part; a fragipan of mottled, very firm, brittle silt loam in the next part; and firm loam in the lower part. In some places limestone bedrock is at a depth of 30 to 60 inches. In other places the slope is less than 2 percent.

Included with this soil in mapping are small areas of the well drained Cincinnati soils on the steeper slopes and small areas of the somewhat poorly drained Avonburg soils on the nose slopes and toe slopes along

Figure 12.—A road cut in an area of Rossmoyne silt loam, 2 to 6 percent slopes, eroded. The fragipan, which has a prismatic type of structure is exposed. The prisms are 1 to 3 feet across and are the least erodible part of the soil. They leave a scalloped effect.

drainageways. Also included are colluvial soils in drainageways. Included soils make up about 5 to 15 percent of the unit.

The Rossmoyne soil is slowly permeable in the fragipan. It has a seasonal high water table at a depth of 1.5 to 3.0 feet for short periods in the winter and early in spring. Available water capacity is moderate. Organic matter content is moderately low in the surface layer. Surface runoff is medium. The surface layer is dominantly medium acid. It is friable and can be easily tilled throughout a fairly wide range in moisture content. Root penetration is restricted by the fragipan. The shrink-swell potential is moderate.

Most areas are used for cultivated crops. Some are used for hay, pasture, or woodland.

This soil is well suited to corn, soybeans, and small grain. Measures that control erosion and runoff are needed if cultivated crops are grown. Examples are cover crops, a cropping sequence that includes grasses and legumes, a conservation tillage system that leaves all or part of the crop residue on the surface, and a combination of contour farming and grassed waterways. Cover crops also help to maintain tilth and increase the organic matter content.

This soil is suited to some of the grasses and legumes used for hay and pasture. Most of the deep rooted legumes, however, are restricted by the fragipan. Most legume stands last from 1 to 3 years. Interseeding legumes helps to maintain the stand. The major concern of management is overgrazing or grazing during wet periods. Grazing when the soil is wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

A few areas are wooded with hardwoods. This soil is well suited to trees. The main concerns of management are seedling mortality, the windthrow hazard, and plant competition. Seedlings survive and grow well if competing vegetation is controlled by site preparation or by spraying, cutting, or girdling. Thinning methods that do not isolate the remaining trees or leave them widely spaced help to prevent windthrow. Excluding livestock helps to prevent deterioration of the woodland. Harvesting mature trees and fostering the growth of seed trees improve the woodland.

The wetness is a severe limitation if this soil is used as a site for dwellings with basements. The wetness and the shrink-swell potential are moderate limitations on sites for buildings without basements. A subsurface drainage system around the footings helps to remove seepage water on the fragipan. Reinforcing foundations, footings, and basement walls and backfilling with coarse material help to prevent the structural damage caused by shrinking and swelling.

Frost action and low strength are severe limitations if this soil is used as a site for local roads and streets. Roadside ditches help to remove excess water and thus help to prevent the damage caused by frost action. Providing coarse grained subgrade or base material helps to prevent the damage caused by low strength.

The slow permeability and the wetness are severe limitations if this soil is used as a septic tank absorption field. Enlarging the absorption field and providing coarse fill material help to overcome the slow permeability. Perimeter drains around the edges of the field help to remove excess water.

The capability subclass is IIe; woodland suitability subclass 2d.

RuB—Russell silt loam, 1 to 5 percent slopes. This gently sloping, deep, well drained soil is on summits, shoulder slopes, and back slopes on loess covered glacial till plains. Areas are irregular in shape and are 2 to 20 acres in size. Slopes are 50 to 150 feet long.

In a typical profile, the surface layer is brown silt loam about 8 inches thick. The subsoil is about 42 inches thick. It is brown, dark yellowish brown, and yellowish brown, firm silt loam and silty clay loam in the upper part and dark yellowish brown and yellowish brown, firm loam in the lower part. The substratum to a depth of 60 inches is yellowish brown loam. In some small areas plowing has mixed the upper part of the subsoil with the surface layer. In places limestone bedrock at a depth of 40 to 60 inches is overlain by silty clay that formed in residuum.

Included with this soil in mapping are small areas of the moderately well drained Xenia soils near summits and around drainageways and small areas of the poorly drained Cyclone soils in small drainageways. These soils make up about 3 to 15 percent of the unit.

Permeability is moderate in the Russell soil, and available water capacity is high. Organic matter content is moderately low in the surface layer. Surface runoff is medium. The surface layer is dominantly neutral. It is friable and can be easily tilled throughout a fairly wide range in moisture content. The shrink-swell potential is moderate.

Most areas are used for cultivated crops. This soil is well suited to corn, soybeans, and small grain. Measures that help to control erosion and runoff are needed if cultivated crops are grown. Examples are cover crops, a cropping sequence that includes grasses and legumes, a conservation tillage system that leaves all or part of the crop residue on the surface, and a combination of contour farming and grassed waterways. Cover crops also help to maintain tilth and increase the organic matter content.

This soil is well suited to hay or pasture. A cover of grasses and legumes is effective in controlling wind and water erosion. Overgrazing or grazing when the soil is wet, however, causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use

during wet periods help to keep the pasture and the soil in good condition.

A few areas are used as orchards or support hardwoods. This soil is well suited to trees. Plant competition is the main concern of management. Seedlings survive and grow well if competing vegetation is controlled by site preparation or by spraying, cutting, or girdling. Excluding livestock helps to prevent deterioration of the woodland. Harvesting mature trees and fostering the growth of seed trees improve the woodland.

The shrink-swell potential is a moderate limitation if this soil is used as a site for buildings. Reinforcing foundations and footings and backfilling with coarse material, however, help to prevent the structural damage caused by shrinking and swelling. Frost action and low strength are severe limitations on sites for local roads and streets. Providing coarse grained subgrade or base material, however, helps to prevent the damage caused by frost action and low strength.

The moderate permeability is a moderate limitation if this soil is used as a septic tank absorption field. Enlarging the absorption field so that the effluent is spread over a large area, however, helps to overcome this limitation.

The capability subclass is IIe; woodland suitability subclass 1o.

So—Sloan silt loam, frequently flooded. This nearly level, deep, very poorly drained soil is in swales on flood plains. It is frequently flooded for brief periods in the winter and spring and is frequently ponded by surface runoff from the adjacent higher lying areas. Areas are long and narrow and are 5 to 25 acres in size.

In a typical profile, the surface soil is very dark gray silt loam about 13 inches thick. It is mottled in the lower part. The subsoil is dark gray, mottled, firm loam about 31 inches thick. The substratum to a depth of 60 inches is gray, mottled loam. In some areas, the surface layer is organic and the subsoil is greenish. In other areas the surface layer is dark grayish brown and is less than 7 inches thick.

Included with this soil in mapping are some small, narrow areas of the somewhat poorly drained Orrville soils near stream channels. These soils make up about 5 to 12 percent of the unit.

The Sloan soil is moderately permeable. It has a seasonal high water table at or near the surface much of the year. Available water capacity is high. Organic matter content is high in the surface layer. Surface runoff is very slow or ponded. The surface layer is neutral. It is friable and can be easily tilled throughout a moderate range in moisture content.

Most areas are used for cultivated crops. Some are used as woodland. A few are used for hay or pasture.

This soil is well suited to corn and soybeans. Spring and winter flooding is the major hazard, and the wetness is the major limitation. Excess water can be removed by subsurface drains, surface drains, or pumps or by a combination of these. Building levees helps to protect crops from floodwater. Green manure crops and a conservation tillage system that leaves all or part of the crop residue on the surface help to maintain good tilth and increase the organic matter content.

This soil is well suited to grasses for hay and pasture but is subject to flooding and ponding. Overgrazing or grazing when the soil is wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is suited to trees. The equipment limitation, seedling mortality, the windthrow hazard, and plant competition are the main concerns of management. Trees should be planted and harvested during dry periods or during periods when the ground is frozen. Water tolerant species should be selected for planting. The competing trees and shrubs can be controlled by site preparation or by spraying, cutting, or girdling. Excluding livestock helps to prevent deterioration of the woodland. Harvesting mature trees and fostering the growth of seed trees improve the woodland.

This soil generally is unsuitable as a site for buildings and sanitary facilities because of the flooding and the wetness. Low strength, wetness, and flooding are severe limitations on sites for roads. Constructing the roads on raised, well compacted fill material and providing adequate side ditches and culverts help to prevent the damage caused by flooding and frost action.

The capability subclass is IIIw; woodland suitability subclass 2w.

Sr—Starks silt loam. This nearly level, deep, somewhat poorly drained soil is on outwash terraces. Areas are irregular in shape and are 3 to 30 acres in size. Slopes are 100 to 400 feet long.

In a typical profile, the surface layer is dark grayish brown silt loam about 8 inches thick. The subsurface layer is gray, mottled silt loam about 5 inches thick. The subsoil is about 43 inches thick. It is mottled. It is grayish brown, firm silty clay loam in the upper part and yellowish brown, firm loam and silt loam in the lower part. The upper part of the substratum is dark yellowish brown, mottled silt loam. The lower part to a depth of about 80 inches is multicolored, stratified sandy loam and silt loam. In places till is at a depth of 60 inches.

Included with this soil in mapping are areas of the poorly drained Cyclone soils in the slightly lower depressions and small areas of colluvial soils in drainageways. These soils make up about 5 to 15 percent of the unit.

The Starks soil is moderately permeable. It has a seasonal high water table at a depth of 1 to 3 feet. Available water capacity is high. Organic matter content

is moderately low in the surface layer. Surface runoff is slow. The surface layer is dominantly neutral. It is friable and can be easily tilled throughout a fairly wide range in moisture content. The shrink-swell potential is moderate.

Most areas are used for cultivated crops. A few are used for hay, pasture, or woodland.

This soil is well suited to corn, soybeans, and small grain. Wetness is the major limitation. If an adequate drainage system is installed, row crops can be grown in most years. A surface and subsurface drainage system is needed to lower the water table. Diversions help to prevent the wetness caused by runoff from the adjacent higher lying soils. Cover crops and a conservation tillage system that leaves all or part of the crop residue on the surface help to maintain good tilth and increase the organic matter content.

This soil is suited to grasses and legumes for hay and pasture, especially to deep rooted legumes that are tolerant of a seasonal high water table. The major concern of management is overgrazing or grazing during wet periods. Grazing when the soil is wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in excellent condition.

This soil is suited to trees. Plant competition is the main concern of management. Seedlings survive and grow well if competing vegetation is controlled by site preparation or by spraying, cutting, or girdling. Excluding livestock helps to prevent deterioration of the woodland. Harvesting mature trees and fostering the growth of seed trees improve the woodland.

The wetness is a severe limitation and the shrink-swell potential a moderate limitation if this soil is used as a site for buildings. Because of the wetness, the soil is better suited to dwellings without basements than to dwellings with basements. Installing foundation drainage tile that removes excess water helps to overcome the wetness. Backfilling with coarse material and reinforcing foundations and footings help to prevent the structural damage caused by shrinking and swelling.

Frost action and low strength are severe limitations if this soil is used as a site for local roads and streets. Providing coarse grained subgrade or base material helps to prevent the damage caused by low strength. Road ditches and culverts remove excess water and thus help to prevent the damage caused by frost action.

The wetness is a severe limitation if this soil is used as a septic tank absorption field. Perimeter drains that lower the water table help to remove excess water before it reaches the absorption field.

The capability subclass is IIw; woodland suitability subclass 2o.

St—Stonelick fine sandy loam, frequently flooded. This nearly level, deep, well drained soil is on the higher swells along the main stream channel on flood plains. It is frequently flooded for very brief periods in the winter and spring. Areas are narrow and irregular in shape. They are dominantly about 20 acres in size but range from 5 to 40 acres.

In a typical profile, the surface layer is dark brown fine sandy loam about 8 inches thick. The upper part of the substratum is dark brown fine sandy loam. The lower part to a depth of about 60 inches is brown loamy sand and sand. In some areas the content of clay is higher throughout the profile.

Included with this soil in mapping are small areas of the moderately well drained Lobdell soils in similar positions on the landscape. These soils make up about 9 to 15 percent of the unit.

Permeability is moderately rapid in the Stonelick soil, and available water capacity is moderate. Organic matter content is moderately low in the surface layer. Surface runoff is slow. The surface layer is mildly alkaline. It is very friable and can be easily tilled throughout a wide range in moisture content.

Most areas are used as woodland. Some are used for cultivated crops. Some are used for hay and pasture.

This soil is suited to corn and soybeans. Spring and winter flooding is the major hazard, and the moderate available water capacity is the major limitation. Levees could be built to protect crops from floodwater, but most areas are natural levees. Green manure crops and a conservation tillage system that leaves all or part of the crop residue on the surface help to maintain good tilth and increase the organic matter content.

This soil is well suited to grasses and legumes for hay and pasture, but it is subject to flooding. Overgrazing or grazing when the soil is wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during dry periods help to keep the pasture and the soil in good condition.

This soil is suited to trees. Plant competition is the main concern of management. The competing trees and shrubs can be controlled by site preparation or by spraying, cutting, or girdling. Excluding livestock helps to prevent deterioration of the woodland. Harvesting mature trees and fostering the growth of seed trees improve the woodland.

Because of the flooding, this soil is generally unsuitable as a site for buildings and sanitary facilities. The flooding is a severe hazard on sites for roads. Constructing the roads on raised, well compacted fill material and providing adequate side ditches and culverts, however, help to prevent the damage caused by flooding.

The capability subclass is IIIw; woodland suitability subclass 2o.

Ud—Udorthents-Pits complex. This map unit occurs as areas of nearly level to steep, very shallow to deep, well drained spoil material left by the mining of limestone

and gravel and sand. It is on uplands, outwash plains, terraces, and kames. Areas range from 1 to 60 acres in size. They are 50 to 60 percent Udorthents and 40 to 50 percent Pits. The Udorthents and the Pits occur as areas so intricately mixed or so small that mapping them separately is not practical.

In a typical area of the Udorthents, the surface layer is brown gravelly loam about 12 inches thick. It is underlain by loamy till or outwash. In many areas layers are bouldery or stony. In about 30 percent of the areas, the gravelly loam is as much as 3 feet thick.

The Pits are open excavations from which gravel and limestone have been removed. About 20 percent of the surface is covered with broken rock the size of stones and boulders. Very few or no plants grow in these areas.

Included with the Udorthents and Pits in mapping are small water-filled pits, which make up about 15 percent of the unit.

Permeability, available water capacity, and organic matter content vary. Surface runoff is slow to rapid. The surface layer is moderately alkaline to medium acid.

The Udorthents are suited to pasture. The shallowness to bedrock and the slow permeability in the till limit root penetration and the available water capacity. The major concern of management is overgrazing or grazing during wet periods, which causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition. Unless the broken rock is an obstacle, interseeding legumes helps to maintain the stand.

This map unit is poorly suited to trees. Very shallow bedrock limits root penetration. The roots penetrate only through cracks in the bedrock.

Onsite investigation is needed before any use is planned for these soils.

The capability class is VII.

WmB—Williamstown silt loam, 1 to 5 percent slopes. This gently sloping, deep, moderately well drained soil is on convex slopes on broad glacial till plains. Areas are irregular in shape and are 3 to 12 acres in size. Slopes are 40 to 150 feet long.

In a typical profile, the surface layer is brown silt loam about 9 inches thick. The subsoil is about 28 inches of yellowish brown, mottled, firm clay loam and loam. The substratum to a depth of 60 inches is yellowish brown, mottled loam. In some areas the silt loam surface layer is more than 9 inches thick. In other areas the subsoil is coarser textured. In some places the till does not contain pebbles, is sandy loam, and is more permeable. In other places the soil is severely eroded.

Included with this soil in mapping are small areas of the somewhat poorly drained Crosby soils on toe slopes. Also included are small areas of the well drained Miami soils, which are in positions on the landscape similar to those of the Williamstown soil. Included soils make up about 9 percent of the unit.

The Williamstown soil is moderately permeable in the subsoil and moderately slowly permeable in the substratum. It has a seasonal high water table at a depth of 1.5 to 3.5 feet. Available water capacity is high. Organic matter content is moderately low in the surface layer. Surface runoff is medium. The surface layer is dominantly medium acid. It is friable and can be easily tilled throughout a fairly wide range in moisture content. The shrink-swell potential is moderate.

Most areas are used for cultivated crops. A few are used for hay or pasture or are wooded with hardwoods.

This soil is well suited to corn, soybeans, and small grain. Measures that control erosion and runoff are needed if cultivated crops are grown. Cover crops, a cropping sequence that includes grasses and legumes, a conservation tillage system that leaves all or part of the crop residue on the surface, and a combination of contour farming and grassed waterways help to prevent excessive soil loss. Cover crops also increase the organic matter content and help to maintain tilth. A subsurface drainage system is needed to drain seepy areas in drainageways and on toe slopes.

This soil is suited to hay or pasture, but the wetness is a limitation affecting some deep rooted legumes. The major concern of management is overgrazing or grazing when the soil is wet, which causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is well suited to trees. Plant competition is the main concern of management. Seedlings survive and grow well if competing vegetation is controlled by site preparation or by spraying, cutting, or girdling. Excluding livestock helps to prevent deterioration of the woodland. Harvesting mature trees and fostering the growth of seed trees improve the woodland.

The wetness is a severe limitation if this soil is used as a site for dwellings with basements, and the wetness and the shrink-swell potential are moderate limitations on sites for buildings without basements. Installing a subsurface drainage system around foundations and footings helps to overcome the wetness. Reinforcing foundations and footings and backfilling with coarse material help to prevent the structural damage caused by shrinking and swelling.

Low strength and frost action are severe limitations if this soil is used as a site for local roads and streets. Adequate road ditches help to remove excess water and thus help to prevent the damage caused by frost action. Providing coarse grained subgrade or base material helps to prevent the damage caused by low strength and frost action.

The moderately slow permeability and the wetness are severe limitations if this soil is used as a septic tank

absorption field. Enlarging the absorption field or installing the field in 2 or 3 feet of coarse fill material helps to overcome the moderately slow permeability of the subsoil. Perimeter drains help to remove excess water before it reaches the absorption field.

The capability subclass is IIe; woodland suitability subclass 1o.

XnA—Xenia silt loam, 0 to 2 percent slopes. This nearly level, deep, moderately well drained soil is on smooth, loess covered glacial till plains. Areas are generally elliptical and are 2 to 12 acres in size. Slopes are 100 to 250 feet long.

In a typical profile, the surface layer is dark brown silt loam about 9 inches thick. The subsoil is about 37 inches thick. The upper part is dark yellowish brown, firm silt loam and silty clay loam, and the lower part is yellowish brown, mottled, firm silty clay loam and clay loam. The substratum to a depth of 60 inches is brown loam. In some areas it is sandy loam and is more permeable. In other areas limestone bedrock is at a depth of 40 to 60 inches.

Included with this soil in mapping are some small, narrow areas of the somewhat poorly drained Fincastle and well drained Russell soils in similar positions on the landscape. These soils make up about 5 to 10 percent of the unit.

The Xenia soil is moderately slowly permeable. It has a seasonal high water table at a depth of 2 to 6 feet. Available water capacity is high. Organic matter content is moderately low in the surface layer. Surface runoff is slow. The surface layer is dominantly neutral. It is friable and can be easily tilled throughout a fairly wide range in moisture content. The shrink-swell potential is moderate.

Most areas are used for cultivated crops. A few are used for hay or pasture or are wooded with hardwoods.

This soil is well suited to corn, soybeans, and small grain. A conservation tillage system that leaves all or part of the crop residue on the surface and cover crops help to maintain tilth and increase the organic matter content.

This soil is well suited to hay or pasture. The major concern of management is overgrazing or grazing when the soil is wet, which causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is well suited to trees. Plant competition is the main concern of management. Seedlings survive and grow well if competing vegetation is controlled by site preparation or by spraying, cutting, or girdling. Excluding livestock helps to prevent deterioration of the woodland. Harvesting mature trees and fostering the growth of seed trees improve the woodland.

The wetness is a severe limitation if this soil is used as a site for dwellings with basements, and the wetness and the shrink-swell potential are moderate limitations on sites for buildings without basements. Installing a subsurface drainage system around the foundations and footings helps to overcome the wetness. Reinforcing foundations and footings and backfilling with coarse material help to prevent structural damage caused by shrinking and swelling.

Low strength and frost action are severe limitations if this soil is used as a site for local roads and streets. Adequate road ditches help to remove excess water and thus help to prevent the damage caused by frost action. Providing coarse grained subgrade or base material helps to prevent the damage caused by low strength and frost action.

The moderately slow permeability and the wetness are severe limitations if this soil is used as a septic tank absorption field. Enlarging the absorption field or installing the field in 2 or 3 feet of coarse fill material helps to overcome the moderately slow permeability of the subsoil. Perimeter drains help to remove the excess water before it reaches the absorption field.

The capability class is I; woodland suitability subclass 1o.

XnB—Xenia silt loam, 2 to 4 percent slopes. This gently sloping, deep, moderately well drained soil is on convex slopes on broad, loess covered glacial till plains. Areas are irregular in shape and are 3 to 15 acres in size. Slopes are 50 to 150 feet long.

In a typical profile, the surface layer is dark brown silt loam about 8 inches thick. The subsoil is about 36 inches thick. It is yellowish brown and firm. It is silty clay loam in the upper part, mottled silty clay loam in the next part, and mottled clay loam and loam in the lower part. The substratum to a depth of 60 inches is yellowish brown, mottled loam. In some areas it is sandy loam and is more permeable. In other areas limestone bedrock is at a depth of 40 to 60 inches. In places the slope is less than 2 percent.

Included with this soil in mapping are some small, narrow areas of the somewhat poorly drained Fincastle and well drained Russell soils in similar positions on the landscape. Also included are small areas of colluvial soils in drainageways. Included soils make up about 2 to 10 percent of the unit.

The Xenia soil is moderately slowly permeable. It has a seasonal high water table at a depth of 2 to 6 feet. Available water capacity is high. Organic matter content is moderately low in the surface layer. Surface runoff is medium. The surface layer is dominantly neutral. It is friable and can be easily tilled throughout a fairly wide range in moisture content. The shrink-swell potential is moderate.

Most areas are used for cultivated crops. A few are used for hay or pasture or are wooded with hardwoods.

This soil is well suited to corn, soybeans, and small grain. Measures that help to control erosion and runoff

are needed if cultivated crops are grown. Examples are cover crops, a cropping sequence that includes grasses and legumes, a conservation tillage system that leaves all or part of the crop residue on the surface (fig. 13), and a combination of contour farming and grassed waterways. Cover crops also help to maintain tilth and increase the organic matter content.

This soil is well suited to hay or pasture. The major concern of management is overgrazing or grazing when the soil is wet, which causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is well suited to trees. Plant competition is the main concern of management. Seedlings survive and grow well if competing vegetation is controlled by site preparation or by spraying, cutting, or girdling. Excluding livestock helps to prevent deterioration of the woodland. Harvesting mature trees and fostering the growth of seed trees improve the woodland.

The wetness is a severe limitation if this soil is used as a site for dwellings with basements, and the shrink-swell potential and the wetness are moderate limitations on sites for buildings without basements. Installing a subsurface drainage system around the foundations and footings helps to overcome the wetness. Reinforcing foundations and footings and backfilling with coarse material help to prevent the structural damage caused by shrinking and swelling.

Frost action and low strength are severe limitations if this soil is used as a site for local roads and streets. Adequate road ditches help to remove excess water and thus help to prevent the damage caused by frost action. Providing coarse grained subgrade or base material helps to prevent the damage caused by low strength and frost action.

The moderately slow permeability and the wetness are

Figure 13.—No-till corn on Xenia silt loam, 2 to 4 percent slopes.

severe limitations if this soil is used as a septic tank absorption field. Enlarging the absorption field or installing the field in 2 or 3 feet of coarse fill material helps to overcome the moderately slow permeability of the subsoil. Perimeter drains help to remove the excess water before it reaches the absorption field.

The capability subclass is IIe; woodland suitability subclass 1o.

prime farmland

Prime farmland is one of several kinds of important farmland defined by the U.S. Department of Agriculture. It is of major importance in providing the Nation's short- and long-range needs for food and fiber. Because the supply of high quality farmland is limited, the U.S. Department of Agriculture recognizes that responsible levels of government, as well as individuals, should encourage and facilitate the wise use of our Nation's prime farmland.

Prime farmland, as defined by the U.S. Department of Agriculture, is the land that is best suited to food, feed, forage, fiber, and oilseed crops. It may be cropland, pasture, woodland, or other land, but it is not urban and built-up land or water areas. It either is used for food or fiber or is available for these uses. The soil qualities, growing season, and moisture supply are those needed for a well managed soil economically to produce a sustained high yield of crops. Prime farmland produces the highest yields with minimal inputs of energy and economic resources, and farming it results in the least damage to the environment.

Prime farmland usually has an adequate and dependable supply of moisture from precipitation or irrigation. The temperature and growing season are favorable. The level of acidity or alkalinity is acceptable. Prime farmland has few or no rocks and is permeable to water and air. It is not excessively erodible or saturated with water for long periods and is not frequently flooded during the growing season. The slope ranges mainly from 0 to 6 percent. More detailed information about the criteria for prime farmland is available at local offices of the Soil Conservation Service.

In Decatur County about 179,405 acres, or about 76 percent of the total acreage, meets the requirements for prime farmland. About 50 percent of the Cincinnati-Rossmoyne-Hickory map unit, which is described under the heading "General soil map units," is prime farmland, and more than 50 percent of the Clermont-Avonburg and Miami-Xenia-Williamstown map units is prime farmland. Nearly all areas in the other general soil map units are prime farmland.

About 60 percent of the area considered prime farmland is used for corn, 30 percent for soybeans, and 10 to 15 percent for small grain or rotation pasture and hay. Crops grown on prime farmland account for almost all of the crop income.

The recent trend is a cropping sequence that includes only corn and soybeans and does not include small grain and rotation hay and pasture. On the more sloping and severely eroded soils used for corn and soybeans, erosion is excessive.

The map units that meet the requirements for prime farmland in Decatur County are listed in this section. Some of the map units meet the requirements only in areas where the soil is drained or protected from flooding, or both. Onsite investigation is needed to determine whether or not a specific area of the soil is adequately drained or protected. This list does not constitute a recommendation for a particular land use. The extent of each listed map unit is shown in table 5. The location is shown on the detailed soil maps at the back of this publication. The soil qualities that affect use and management are described in the section "Detailed soil map units."

The map units that meet the requirements for prime farmland are:

AvA	Avonburg silt loam, 0 to 2 percent slopes (where drained)
AvB	Avonburg silt loam, 2 to 4 percent slopes (where drained)
Cg	Chagrin loam, frequently flooded (where protected from flooding)
Ch	Chagrin Variant silt loam, frequently flooded (where protected from flooding)
CkB2	Cincinnati silt loam, 2 to 6 percent slopes, eroded
CrA	Crosby silt loam, 0 to 3 percent slopes (where drained)
Cy	Cyclone silt loam (where drained)
FcA	Fincastle silt loam, 0 to 2 percent slopes (where drained)
FcB	Fincastle silt loam, 2 to 4 percent slopes (where drained)
FoA	Fox loam, 0 to 2 percent slopes
FoB	Fox loam, 2 to 6 percent slopes
Lb	Lobdell silt loam, frequently flooded (where protected from flooding)
MeA	Martinsville loam, 0 to 2 percent slopes
MeB2	Martinsville loam, 2 to 6 percent slopes, eroded
MmB2	Miami silt loam, 2 to 6 percent slopes, eroded
Mr	Milford silty clay (where drained)
Ms	Millsdale silty clay loam (where drained)
MtA	Milton silt loam, 0 to 2 percent slopes
MtB2	Milton silt loam, 2 to 6 percent slopes, eroded
My	Montgomery silty clay, gravelly substratum (where drained)
OcA	Ockley silt loam, 0 to 2 percent slopes

OcB	Ockley silt loam, 2 to 6 percent slopes
Or	Orrville silt loam, frequently flooded (where drained and protected from flooding)
RsB2	Rossmoyne silt loam, 2 to 6 percent slopes, eroded
RuB	Russell silt loam, 1 to 5 percent slopes
So	Sloan silt loam, frequently flooded (where drained and protected from flooding)
Sr	Starks silt loam (where drained)
WmB	Williamstown silt loam, 1 to 5 percent slopes
XnA	Xenia silt loam, 0 to 2 percent slopes
XnB	Xenia silt loam, 2 to 4 percent slopes

use and management of the soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help avoid soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavior characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops and pasture; as woodland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreation facilities; and for wildlife habitat. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where bedrock, wetness, or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

crops and pasture

Ersel Rodgers, district conservationist, Soil Conservation Service, helped prepare this section.

General management needed for crops and pasture is suggested in this section. The crops or pasture plants best suited to the soils, including some not commonly grown in the survey area, are identified; the system of land capability classification used by the Soil Conservation Service is explained; and the estimated yields of the main crops and hay and pasture plants are listed for each soil.

Planners of management systems for individual fields or farms should consider the detailed information given in the description of each soil under "Detailed soil map units." Specific information can be obtained from the local office of the Soil Conservation Service or the Cooperative Extension Service.

About 200,000 acres in Decatur County was used for crops and pasture in 1974. Of this total, about 20,000 acres was used for permanent pasture, 125,000 acres for row crops, 19,000 acres for small grain, and 28,000 acres for rotation hay and pasture. The rest was idle cropland (*8*).

The potential of the soils of Decatur County for increased production of food is fair. About 10,000 acres of potentially good cropland is currently used as permanent pasture and 6,000 acres as woodland. In addition to the reserve productive capacity represented by this land, food production could also be increased considerably by extending the latest crop production technology to all of the cropland in the county. This soil survey can greatly facilitate the application of such technology (*4*).

The acreage used as pasture has been decreasing because of the unfavorable economic conditions for raising livestock. The acreage used for row crops has steadily increased because of the favorable economic conditions for growing corn and soybeans.

The paragraphs that follow describe the main management needs in the areas of the county used for crops and pasture.

Soil erosion is the major problem on about 60 percent of the cropland and pasture in Decatur County. If the slope is more than 2 percent, erosion is a hazard. It is also a hazard in many areas where the Wisconsin glacial soils have slopes of less than 2 percent but are adjacent to small knobs of more sloping, better drained soils.

Loss of the surface layer through erosion reduces the productivity of soils and results in sedimentation in streams. Soil fertility is reduced when soil particles are washed away. Establishing a stand of corn or soybeans is difficult when the subsoil is the primary seedbed. Erosion also reduces the productivity on droughty soils, especially at pollinating time. Control of erosion helps to maintain the productivity of soils and improves the

quality of water for municipal use, for recreation, and for fish and wildlife by mimimizing the pollution of streams.

Erosion control provides a protective plant cover, reduces the runoff rate, and increases the rate of water infiltration. A cropping system that keeps a plant cover on the soil for extended periods can hold soil losses to an amount that will not reduce the productive capacity of the soils. On livestock farms, where part of the acreage is pasture and hay, including legumes and grasses in the cropping system not only provides nitrogen and improves tilth for the following crop but also reduces the risk of erosion on the more sloping soils.

Slopes generally are so short and irregular that contour farming and terracing are not practical on most of the soils used as cropland in Decatur County. On these soils a conservation cropping system that leaves crop residue on the surface most of the year is needed. Minimizing tillage and leaving crop residue on the surface increase the rate of water infiltration and reduce the hazards of runoff and erosion. Chisel plowing, a widely accepted practice for seedbed preparation, helps to keep residue on the surface. Its benefits, however, are somewhat reduced by disking 2 or 3 times prior to planting. No-till planting, especially of corn, can significantly reduce the risk of erosion and improve the water quality in all of the streams in the county. No-till farming permits continuous row cropping on the rolling soils. If these soils are plowed by conventional moldboards, a cropping sequence that includes grasses and legumes is needed.

Aerial seeding of cover crops in fields of soybeans prior to leaf drop in the fall helps to control erosion in the winter. Also, it provides an ideal no-till planting environment the following spring.

A combination of grassed waterways and grade stabilization structures helps to control gully erosion in areas used for crops and pasture. Dry-dam earthen structures protect crops from the runoff from adjoining uplands. They collect sediment while allowing the runoff to be transported to a safe outlet through underground conduits.

Diversions protect crops from the runoff from the steep soils in the adjacent uplands. They help to control rill and gully erosion and also help to transport excess runoff to a safe outlet.

Both surface and subsurface drainage systems are needed on most of the cropland. On the Wisconsin glacial soils in depressions, a combination of surface drains and field tile is needed. On the upland soils, however, only tile is needed to drain the underground seepage, which keeps the slopes and hilltops too wet for cultivation.

A combination of a surface drainage system or land smoothing and collection ditches is needed to remove excess surface water in areas of the Illinoian glacial soils. A subsurface drainage system is needed to supplement the collection ditches so that they are crossable. Installing a complete subsurface drainage system, however, is very expensive in these soils because of the slow water movement and the fine particles in the subsoil. Many natural drainage channels are not deep enough or stable enough to provide adequate outlets for a tile drainage system. Group drainage projects help to secure adequate drainage outlets for both a surface and a subsurface drainage system.

Soil fertility is affected by reaction and by the content of plant nutrients. It is naturally medium in most soils on uplands and terraces in Decatur County. The soils on flood plains are neutral or mildly alkaline and are naturally higher in content of plant nutrients than most soils on uplands and terraces. The very poorly drained soils are in slight depressions and receive runoff from adjacent upland soils. They normally are slightly acid or neutral.

On all soils lime and fertilizer should be applied according to the results of soil tests, the need of the crop, and the expected level of yields. The Cooperative Extension Service can help in determining the kinds and amounts of fertilizer and lime needed.

Soil tilth is an important factor in the germination of seeds and in the infiltration of water into the soil. Soils with good tilth are granular and porous.

Many of the soils used for crops in the county have a surface layer of dark silt loam that is moderately low in content of organic matter. Generally, the structure of these soils is moderate to weak, and intense rainfall causes surface crusting. The crust in some areas, especially in areas where the surface layer has been removed through erosion, is hard when dry and impervious to water. Once a hard crust forms, the rate of water infiltration is reduced and the runoff rate is increased. Regularly adding crop residue, manure, and other organic material improves tilth and helps to prevent surface crusting.

Fall plowing generally is not suitable on the soils that have a light colored silt loam surface layer because a crust forms during the winter and spring. Many of the soils are nearly as dense and hard at planting time as they were before fall plowing. Also, about 35 percent of the cropland consists of sloping soils that are subject to excessive erosion if they are plowed in the fall.

The field crops suited to the soils and climate in the county include many that are not now commonly grown. Corn and soybeans are the main row crops. Wheat, barley, and oats are the common close-growing crops. Rye could be grown, and grass seed from bromegrass, fescue, redtop, and bluegrass could be produced.

yields per acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 6. In any given year, yields may be

higher or lower than those indicated in the table because of variations in rainfall and other climatic factors.

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations are also considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green manure crops; and harvesting that insures the smallest possible loss.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in table 6 are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Soil Conservation Service or of the Cooperative Extension Service can provide information about the management and productivity of the soils.

land capability classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor does it consider possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for woodland and for engineering purposes.

In the capability system, soils are generally grouped at three levels: capability class, subclass, and unit. Only class and subclass are used in this survey.

Capability classes, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class I soils have slight limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants or that require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants or that require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use.

Class VI soils have severe limitations that make them generally unsuitable for cultivation.

Class VII soils have very severe limitations that make them unsuitable for cultivation.

Class VIII soils and miscellaneous areas have limitations that nearly preclude their use for commercial crop production.

Capability subclasses are soil groups within one class. They are designated by adding a small letter, *e, w, s,* or *c,* to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c,* used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

In class I there are no subclasses because the soils of this class have few limitations. Class V contains only the subclasses indicated by *w, s,* or *c* because the soils in class V are subject to little or no erosion. They have other limitations that restrict their use to pasture, woodland, wildlife habitat, or recreation.

The acreage of soils in each capability class and subclass is shown in table 7. The capability classification of each map unit is given in the section "Detailed soil map units."

woodland management and productivity

Table 8 can be used by woodland owners or forest managers in planning the use of soils for wood crops. Only those soils suitable for wood crops are listed. The table lists the ordination (woodland suitability) symbol for each soil. Soils assigned the same ordination symbol require the same general management and have about the same potential productivity.

The first part of the *ordination symbol*, a number, indicates the potential productivity of the soils for important trees. The number 1 indicates very high productivity; 2, high; 3, moderately high; 4, moderate; and 5, low. The second part of the symbol, a letter, indicates the major kind of soil limitation. The letter *x* indicates stoniness or rockiness; *w*, excessive water in or on the soil; *t*, toxic substances in the soil; *d*, restricted root depth; *c*, clay in the upper part of the soil; *s*, sandy texture; *f*, high content of coarse fragments in the soil

profile; and *r*, steep slopes. The letter *o* indicates that limitations or restrictions are insignificant. If a soil has more than one limitation, the priority is as follows: x, w, t, d, c, s, f, and r.

In table 8, *slight, moderate,* and *severe* indicate the degree of the major soil limitations to be considered in management.

Ratings of the *erosion hazard* indicate the risk of loss of soil in well managed woodland. The risk is *slight* if the expected soil loss is small, *moderate* if measures are needed to control erosion during logging and road construction, and *severe* if intensive management or special equipment and methods are needed to prevent excessive loss of soil.

Ratings of *equipment limitation* reflect the characteristics and conditions of the soil that restrict use of the equipment generally needed in woodland management or harvesting (fig. 14). A rating of *slight* indicates that use of equipment is not limited to a particular kind of equipment or time of year; *moderate* indicates a short seasonal limitation or a need for some modification in management or in equipment; and *severe* indicates a seasonal limitation, a need for special equipment or management, or a hazard in the use of equipment.

Figure 14.—An area of Hickory soils used as woodland. These soils are well suited to trees, but the slopes that are more than 18 percent hinder the use of equipment.

Seedling mortality ratings indicate the degree to which the soil affects the mortality of tree seedlings. Plant competition is not considered in the ratings. The ratings apply to seedlings from good stock that are properly planted during a period of sufficient rainfall. A rating of *slight* indicates that the expected mortality is less than 25 percent; *moderate*, 25 to 50 percent; and *severe*, more than 50 percent.

Ratings of *windthrow hazard* are based on the soil characteristics that affect the development of tree roots and the ability of the soil to hold trees firmly. A rating of *slight* indicates that few trees may be blown down by strong winds; *moderate*, that some trees will be blown down during periods of excessive soil wetness and strong winds; and *severe*, that many trees are blown down during periods of excessive soil wetness and moderate or strong winds.

The *potential productivity* of merchantable or *common trees* on a soil is expressed as a *site index*. This index is the average height, in feet, that dominant and codominant trees of a given species attain in a specified number of years. The site index applies to fully stocked, even-aged, unmanaged stands. Commonly grown trees are those that woodland managers generally favor in intermediate or improvement cuttings. They are selected on the basis of growth rate, quality, value, and marketability.

Trees to plant are those that are suited to the soils and to commercial wood production.

windbreaks and environmental plantings

Windbreaks protect livestock, buildings, and yards from wind and snow. They also protect fruit trees and gardens, and they furnish habitat for wildlife. Several rows of low- and high-growing broadleaf and coniferous trees and shrubs provide the most protection.

Field windbreaks are narrow plantings made at right angles to the prevailing wind and at specific intervals across the field. The interval depends on the erodibility of the soil. Field windbreaks protect cropland and crops from wind, keep snow from blowing off the fields, and provide food and cover for wildlife.

Environmental plantings help to beautify and screen houses and other buildings and to abate noise. The plants, mostly evergreen shrubs and trees, are closely spaced. To insure plant survival, a healthy planting stock of suitable species should be planted properly on a well prepared site and maintained in good condition.

Table 9 shows the height that locally grown trees and shrubs are expected to reach in 20 years on various soils. The estimates in table 9 are based on measurements and observation of established plantings that have been given adequate care. They can be used as a guide in planning windbreaks and screens.

Additional information on planning windbreaks and screens and planting and caring for trees and shrubs can be obtained from local offices of the Soil Conservation Service or the Cooperative Extension Service or from a nursery.

recreation

The soils of the survey area are rated in table 10 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewerlines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation are also important. Soils subject to flooding are limited for recreation use by the duration and intensity of flooding and the season when flooding occurs. In planning recreation facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 10, the degree of soil limitation is expressed as slight, moderate, or severe. *Slight* means that soil properties are generally favorable and that limitations are minor and easily overcome. *Moderate* means that limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures.

The information in table 10 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 13 and interpretations for dwellings without basements and for local roads and streets in table 12.

Camp areas require site preparation, such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils have mild slopes and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing campsites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes or stones or boulders that increase the cost of shaping

sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use (fig. 15). The surface is free of stones and boulders, is firm after rains, and is not dusty when dry. If grading is needed, the depth of the soil over bedrock or a fragipan should be considered.

Paths and trails for hiking, horseback riding, and bicycling should require little or no cutting and filling. The best soils are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once a year during the period of use. They have moderate slopes and few or no stones or boulders on the surface.

Golf fairways are subject to heavy foot traffic and some light vehicular traffic. Cutting or filling may be required. The best soils for use as golf fairways are firm when wet, are not dusty when dry, and are not subject to prolonged flooding during the period of use. They have moderate slopes and no stones or boulders on the surface. The suitability of the soil for tees or greens is not considered in rating the soils.

wildlife habitat

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. The kind and abundance of wildlife depend largely on the amount and distribution of food, cover, and water. Wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants.

In table 11, the soils in the survey area are rated according to their potential for providing habitat for various kinds of wildlife. This information can be used in planning parks, wildlife refuges, nature study areas, and other developments for wildlife; in selecting soils that are suitable for establishing, improving, or maintaining specific elements of wildlife habitat; and in determining the intensity of management needed for each element of the habitat.

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* indicates that the element or kind of habitat is easily established, improved, or maintained. Few or no limitations affect management,

Figure 15.—Flooding on Chagrin loam, frequently flooded. Limitations for playgrounds are severe because of the frequent flooding.

and satisfactory results can be expected. A rating of *fair* indicates that the element or kind of habitat can be established, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* indicates that limitations are severe for the designated element or kind of habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* indicates that restrictions for the element or kind of habitat are very severe and that unsatisfactory results can be expected. Creating, improving, or maintaining habitat is impractical or impossible.

The elements of wildlife habitat are described in the following paragraphs.

Grain and seed crops are domestic grains and seed-producing herbaceous plants. Soil properties and features that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of grain and seed crops are corn, soybeans, wheat, oats, rye, sorghum, and sunflowers.

Grasses and legumes are domestic perennial grasses and herbaceous legumes. Soil properties and features that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flood hazard, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are fescue, timothy, lovegrass, bromegrass, bluegrass, clover, and alfalfa.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds. Soil properties and features that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of wild herbaceous plants are bluestem, goldenrod, beggarweed, wheatgrass, ragweed, pokeweed, sheep sorrel, dock, crabgrass, and dandelion.

Hardwood trees and woody understory produce nuts or other fruit, buds, catkins, twigs, bark, and foliage. Soil properties and features that affect the growth of hardwood trees and shrubs are depth of the root zone, the available water capacity, and wetness. Examples of these plants are oak, poplar, beech, wild cherry, sweetgum, willow, black walnut, apple, hawthorn, dogwood, hickory, hazelnut, blackberry, elderberry, and blueberry. Examples of fruit-producing shrubs that are suitable for planting on soils rated *good* are Russian-olive, autumn-olive, and crabapple.

Coniferous plants furnish browse, seeds, and cones. Soil properties and features that affect the growth of coniferous trees, shrubs, and ground cover are depth of the root zone, available water capacity, and wetness. Examples of coniferous plants are pine, spruce, fir, cedar, and juniper.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites. Submerged or floating aquatic plants are excluded. Soil properties and features affecting wetland plants are texture of the surface layer, wetness, reaction, salinity, slope, and surface stoniness. Examples of wetland plants are smartweed, pondweed, spikerush, wild millet, wildrice, saltgrass, algae, cordgrass, rushes, sedges, and reeds.

Shallow water areas have an average depth of less than 5 feet. Some are naturally wet areas. Others are created by dams, levees, or other water-control structures. Soil properties and features affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. Examples of shallow water areas are marshes, waterfowl feeding areas, and ponds.

The habitat for various kinds of wildlife is described in the following paragraphs.

Habitat for openland wildlife consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. The wildlife attracted to these areas include bobwhite, pheasant, dove, meadowlark, killdeer, field sparrow, cottontail, red fox, and woodchuck.

Habitat for woodland wildlife consists of areas of deciduous plants or coniferous plants or both and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include wild turkey, ruffed grouse, woodcock, thrushes, woodpeckers, squirrels, gray fox, raccoon, and white-tailed deer.

Habitat for wetland wildlife consists of open, marshy or swampy shallow water areas. Some of the wildlife attracted to such areas are ducks, geese, herons, shore birds, rails, kingfishers, muskrat, mink, and beaver.

engineering

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. The ratings are given in the following tables: Building site development, Sanitary facilities, Construction materials, and Water management. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil properties" section.

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and

construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations need to be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 to 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to (1) evaluate the potential of areas for residential, commercial, industrial, and recreation uses; (2) make preliminary estimates of construction conditions; (3) evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; (4) evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; (5) plan detailed onsite investigations of soils and geology; (6) locate potential sources of gravel, sand, earthfill, and topsoil; (7) plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and (8) predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Glossary.

building site development

Table 12 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock, a cemented pan, or a very firm dense layer; stone content; soil texture; and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and the depth to the water table.

Dwellings and small commercial buildings are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrink-swell potential, and organic layers can cause the movement of footings. A high water table, depth to bedrock or to a cemented pan, large stones, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 to 6 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material, a base of gravel, crushed rock, or stabilized soil material, and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. Depth to bedrock or to a cemented pan, a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, frost action potential, and depth to a high water table affect the traffic supporting capacity.

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. The ratings are based on soil properties, site features, and observed performance of the soils. Soil

reaction, a high water table, depth to bedrock or to a cemented pan, the available water capacity in the upper 40 inches, and the content of salts, sodium, and sulfidic materials affect plant growth. Flooding, wetness, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer affect trafficability after vegetation is established.

sanitary facilities

Table 13 shows the degree and kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Table 13 also shows the suitability of the soils for use as daily cover for landfills. A rating of *good* indicates that soil properties and site features are favorable for the use and good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, depth to bedrock or to a cemented pan, and flooding affect absorption of the effluent. Large stones and bedrock or a cemented pan interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to filter the effluent effectively. Many local ordinances require that this material be of a certain thickness.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water.

Table 13 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, depth to bedrock or to a cemented pan, flooding, large stones, and content of organic matter.

Excessive seepage due to rapid permeability of the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope, bedrock, and cemented pans can cause construction problems, and large stones can hinder compaction of the lagoon floor.

Sanitary landfills are areas where solid waste is disposed of by burying it in soil. There are two types of landfill—trench and area. In a trench landfill, the waste is placed in a trench. It is spread, compacted, and covered daily with a thin layer of soil excavated at the site. In an area landfill, the waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground water pollution. Ease of excavation and revegetation needs to be considered.

The ratings in table 13 are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock or to a cemented pan, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium affect trench type landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area type sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, wetness, coarse fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to wind erosion.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock, a cemented pan, or the water table to permit revegetation. The soil material used as final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

construction materials

Table 14 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill and topsoil. They are rated as a probable or improbable source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated *poor* have a plasticity index of more than 10, a high shrink-swell potential, many stones, or slopes of more than 25 percent. They are wet, and the depth to the water table is less than 1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

Sand and gravel are natural aggregates suitable for commercial use with a minimum of processing. Sand and gravel are used in many kinds of construction. Specifications for each use vary widely. In table 14, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), the thickness of suitable material, and the content of rock fragments. Kinds of rock, acidity, and stratification are given in the soil series descriptions. Gradation of grain sizes is given in the table on engineering index properties.

A soil rated as a probable source has a layer of clean sand or gravel or a layer of sand or gravel that is up to 12 percent silty fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an improbable source. Coarse fragments of soft bedrock, such as shale and siltstone, are not considered to be sand and gravel.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by toxic material and by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, bedrock, and toxic material.

Soils rated *good* have friable loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are low in content of soluble salts, are naturally fertile or respond well to fertilizer, and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel, stones, or soluble salts, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel, stones, or soluble salts, have slopes of more than 15 percent, or have a seasonal water table at or near the surface.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

water management

Table 15 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas; embankments, dikes, and levees; and aquifer-fed excavated ponds. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives for each soil the restrictive features that affect drainage, terraces and diversions, and grassed waterways.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, or salts or sodium. A high water table affects the amount of usable material. It also affects trafficability.

Aquifer-fed excavated ponds are pits or dugouts that extend to a ground-water aquifer or to a depth below a permanent water table. Excluded are ponds that are fed only by surface runoff and embankment ponds that impound water 3 feet or more above the original surface. Excavated ponds are affected by depth to a permanent water table, permeability of the aquifer, and quality of the water as inferred from the salinity of the soil. Depth to bedrock and the content of large stones affect the ease of excavation.

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock, to a cemented pan, or to other layers that affect the rate of water movement, permeability, depth to a high water table or depth of standing water if the soil is subject to ponding; slope; susceptibility to flooding; subsidence of organic layers; and potential frost action. Excavating and grading and the stability of ditchbanks are affected by depth to bedrock or to a cemented pan, large stones, slope, and the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by extreme acidity or by toxic substances in the root zone, such as salts, sodium, or sulfur. Availability of drainage outlets is not considered in the ratings.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to reduce erosion and conserve moisture by intercepting runoff. Slope, wetness, large stones, and depth to bedrock or to a cemented pan affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of wind or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock or to a cemented pan affect the construction of grassed waterways. A hazard of wind erosion, low available water capacity, restricted rooting depth, toxic substances, such as salts or sodium, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

soil properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classifications, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

engineering index properties

Table 16 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under "Soil series and their morphology."

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is as much as 15 or 20 percent, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

Classification of the soils is determined according to the Unified soil classification system (*2*) and the system adopted by the American Association of State Highway and Transportation Officials (*1*).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as Pt. Soils exhibiting engineering properties of two groups can have a dual classification, for example, SP-SM.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection. If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6.

Rock fragments larger than 3 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

physical and chemical properties

Table 17 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated clay content of each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They determine the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, and plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earthmoving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at 1/3 bar moisture tension. Weight is determined after drying the soil at 105 degrees C. In this table, the estimated moist bulk density of each major soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. A bulk density of more than 1.6 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems, septic tank absorption fields, and construction where the rate of water movement under saturated conditions affects behavior.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Soil reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The change is based on the soil fraction less than 2 millimeters in diameter. The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; and *high*, more than 6 percent. *Very high*, greater than 9 percent, is sometimes used.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K range from 0.05 to 0.69. The higher the value, the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their resistance to wind erosion in cultivated areas. The groups indicate the susceptibility of soil to wind erosion and the amount of soil lost. Soils are grouped according to the following distinctions:

1. Sands, coarse sands, fine sands, and very fine sands. These soils are generally not suitable for crops. They are extremely erodible, and vegetation is difficult to establish.

2. Loamy sands, loamy fine sands, and loamy very fine sands. These soils are very highly erodible. Crops can be grown if intensive measures to control wind erosion are used.

3. Sandy loams, coarse sandy loams, fine sandy loams, and very fine sandy loams. These soils are highly erodible. Crops can be grown if intensive measures to control wind erosion are used.

4L. Calcareous loamy soils that are less than 35 percent clay and more than 5 percent finely divided calcium carbonate. These soils are erodible. Crops can be grown if intensive measures to control wind erosion are used.

4. Clays, silty clays, clay loams, and silty clay loams that are more than 35 percent clay. These soils are moderately erodible. Crops can be grown if measures to control wind erosion are used.

5. Loamy soils that are less than 18 percent clay and less than 5 percent finely divided calcium carbonate and sandy clay loams and sandy clays that are less than 5 percent finely divided calcium carbonate. These soils are slightly erodible. Crops can be grown if measures to control wind erosion are used.

6. Loamy soils that are 18 to 35 percent clay and less than 5 percent finely divided calcium carbonate, except silty clay loams. These soils are very slightly erodible. Crops can easily be grown.

7. Silty clay loams that are less than 35 percent clay and less than 5 percent finely divided calcium carbonate. These soils are very slightly erodible. Crops can easily be grown.

8. Stony or gravelly soils and other soils not subject to wind erosion.

Organic matter is the plant and animal residue in the soil at various stages of decomposition.

In table 17, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter of a soil can be maintained or increased by returning crop residue to the soil. Organic matter affects the available water capacity, infiltration rate, and tilth. It is a source of nitrogen and other nutrients for crops.

soil and water features

Table 18 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are assigned to one of four groups. They are grouped according to the intake of water when the soils are thoroughly wet and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Flooding, the temporary inundation of an area, is caused by overflowing streams or by runoff from adjacent slopes. Water standing for short periods after rainfall or snowmelt and water in swamps and marshes are not considered flooding.

Table 18 gives the frequency and duration of flooding and the time of year when flooding is most likely.

Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, common, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions; *common* that it is likely under normal conditions; *occasional* that it occurs on an average of once or less in 2 years; and *frequent* that it occurs on an average of more than once in 2 years. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, and *long* if more than 7 days. Probable dates are expressed in months; November-May, for example, means that flooding can occur during the period November through May.

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and absence of distinctive horizons that form in soils that are not subject to flooding.

Also considered is local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table (seasonal) is the highest level of a saturated zone in the soil in most years. The depth to a seasonal high water table applies to undrained soils. The estimates are based mainly on the evidence of a saturated zone, namely grayish colors or mottles in the soil. Indicated in table 18 are the depth to the seasonal high water table; the kind of water table—that is, perched, artesian, or apparent; and the months of the year that the water table commonly is high. A water table that is seasonally high for less than 1 month is not indicated in table 18.

An apparent water table is a thick zone of free water in the soil. It is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil. An artesian water table is under hydrostatic head, generally beneath an impermeable layer. When this layer is penetrated, the water level rises in an uncased borehole. A perched water table is water standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

Only saturated zones within a depth of about 6 feet are indicated. A plus sign preceding the range in depth indicates that the water table is above the surface of the soil. The first numeral in the range indicates how high the water rises above the surface. The second numeral indicates the depth below the surface.

Depth to bedrock is given if bedrock is within a depth of 5 feet. The depth is based on many soil borings and on observations during soil mapping. The rock is specified as either soft or hard. If the rock is soft or fractured, excavations generally can be made with trenching machines, backhoes, or small rippers. If the rock is hard or massive, blasting or special equipment generally is needed for excavations.

Potential frost action is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, permeability, content of organic matter, and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not artificially drained. Silty and highly structured clayey soils that have a high water table in winter are the most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage mainly to pavements and other rigid structures.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors creates a severe corrosion environment. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low, moderate,* or *high*, is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion is also expressed as *low*, *moderate*, or *high*. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

classification of the soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (*7*). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. In table 19, the soils of the survey area are classified according to the system. The categories are defined in the following paragraphs.

ORDER. Ten soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Alfisol.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Udalf (*Ud*, meaning humid, plus *alf*, from Alfisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Hapludalfs (*Hapl*, meaning minimal horizonation, plus *udalf*, the suborder of the Alfisols that have a udic moisture regime).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that typifies the great group. An example is Typic Hapludalfs.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Mostly the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, temperature regime, depth of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine-loamy, mixed, mesic Typic Hapludalfs.

SERIES. The series consists of soils that have similar horizons in their profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. The texture of the surface layer or of the substratum can differ within a series.

soil series and their morphology

In this section, each soil series recognized in the survey area is described. The descriptions are arranged in alphabetic order.

Characteristics of the soil and the material in which it formed are identified for each series. The soil is compared with similar soils and with nearby soils of other series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the *Soil Survey Manual* (*6*). Many of the technical terms used in the descriptions are defined in *Soil Taxonomy* (*7*). Unless otherwise stated, colors in the descriptions are for moist soil. Following the pedon description is the range of important characteristics of the soils in the series.

The map units of each soil series are described in the section "Detailed soil map units."

Avonburg series

The Avonburg series consists of deep, somewhat poorly drained, very slowly permeable soils on till plains. These soils have a fragipan. They formed in silty loess and the underlying silty glacial drift and glacial till. Slopes range from 0 to 4 percent.

The Avonburg soils in this county have a lower base saturation in the subsoil and a lower content of clay in the argillic horizon than is defined as the range for the series. These differences, however, do not alter the use or behavior of the soils.

Avonburg soils are commonly adjacent to Clermont and Rossmoyne soils. Clermont soils are on broad flats. They do not have a fragipan. Their A and B horizons are grayer than those of the Avonburg soils. Rossmoyne soils do not have grayish mottles in the A2 horizon and the upper part of the B horizon. They are on the higher swells.

Typical pedon of Avonburg silt loam, 0 to 2 percent slopes, in a cultivated field, 2,110 feet east and 1,180 feet north of the southwest corner of sec. 7, T. 8 N., R. 9 E.

Ap—0 to 7 inches; grayish brown (10YR 5/2) silt loam, light gray (10YR 7/2) dry; moderate medium granular structure; friable; slightly acid; abrupt smooth boundary.

A2—7 to 13 inches; light brownish gray (10YR 6/2) silt loam; common medium distinct yellowish brown (10YR 5/4) mottles; weak thick platy structure parting to moderate medium subangular blocky; friable; few fine iron and manganese oxide accumulations; slightly acid; clear wavy boundary.

B21t—13 to 19 inches; light brownish gray (10YR 6/2) silt loam; many fine distinct yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; firm; thin discontinuous yellowish brown (10YR 5/4) and light brownish gray (10YR 6/2) clay films on faces of peds; strongly acid; clear wavy boundary.

B22t—19 to 27 inches; yellowish brown (10YR 5/6) silt loam; many fine distinct light brownish gray (10YR 6/2) mottles; moderate medium subangular blocky structure; firm; thin discontinuous yellowish brown (10YR 5/4) and light brownish gray (10YR 6/2) clay films on faces of peds; strongly acid; clear wavy boundary.

Bx1—27 to 32 inches; light brownish gray (10YR 6/2) silt loam; common medium distinct yellowish brown (10YR 5/6) mottles; moderate coarse prismatic structure; very firm; brittle; thin discontinuous grayish brown (10YR 5/2) clay films on faces of peds; thick continuous light brownish gray (10YR 6/2) silt coatings on faces of peds; many fine very dark gray (10YR 3/1) iron and manganese oxide accumulations; strongly acid; gradual wavy boundary.

IIBx2—32 to 76 inches; yellowish brown (10YR 5/6) silt loam; many medium distinct grayish brown (10YR 5/2) mottles; strong very coarse prismatic structure; very firm; brittle; thin discontinuous brown (10YR 5/3) clay films on faces of peds; thick continuous light brownish gray (10YR 6/2) silt coatings on faces of peds; many fine very dark gray (10YR 3/1) iron and manganese oxide accumulations; strongly acid; gradual wavy boundary.

IIIB3—76 to 80 inches; yellowish brown (10YR 5/4) silt loam; weak coarse subangular blocky structure; firm; continuous light brownish gray (10YR 6/2) silt coatings on faces of peds; medium acid.

The solum is 72 to 114 inches thick. The loess is 20 to 50 inches thick. The glacial drift is more than 70 inches thick. The depth to the fragipan ranges from 23 to 36 inches.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. It is medium acid to neutral. The A2 horizon has hue of 10YR, value of 5 or 6, and chroma of 2 or 3. It is strongly acid to slightly acid. The B2t, Bx, and IIBx horizons have hue of 10YR, value of 5 or 6, and chroma of 1 to 6. They are silt loam or silty clay loam. They are very strongly acid or strongly acid. The IIIB horizon has hue of 10YR or 7.5YR, value of 5 or 6, and chroma of 3 to 6. It is silt loam, loam, or clay loam. It is very strongly acid to slightly acid.

Chagrin series

The Chagrin series consists of deep, well drained, moderately permeable soils on flood plains. These soils formed in recent loamy alluvium. Slopes range from 0 to 2 percent.

The Chagrin soils in this county have a lower content of clay in the subsoil than is defined as the range for the series. This difference, however, does not alter the use or behavior of the soils.

Chagrin soils are commonly adjacent to Lobdell, Orrville, and Stonelick soils. Lobdell soils have low chroma mottles within a depth of 20 inches. They generally are on the lower lying parts of the landscape. Orrville soils have a low chroma matrix directly below the A horizon. They are on the lower lying parts of the landscape. Stonelick soils are less clayey throughout than the Chagrin soils. They generally are adjacent to streams.

Typical pedon of Chagrin loam, frequently flooded, in a cultivated field, 1,600 feet south and 520 feet west of the northeast corner of sec. 16, T. 9 N., R. 9 E.

Ap—0 to 8 inches; brown (10YR 4/3) loam, pale brown (10YR 6/3) dry; weak fine granular structure; friable; neutral; abrupt smooth boundary.

B2—8 to 40 inches; brown (10YR 5/3) loam; moderate fine subangular blocky structure; friable; dark brown (10YR 4/3) organic coatings on faces of peds; neutral; gradual wavy boundary.

C—40 to 60 inches; brown (10YR 5/3) loam; massive; friable; neutral.

The solum is 24 to 48 inches thick. The Ap horizon is dark grayish brown (10YR 4/2) or brown (10YR 4/3) loam or silt loam. It is neutral or slightly acid. The B2 horizon has hue of 10YR, value of 4 or 5, and chroma of

3 or 4. It is silt loam or loam and is neutral or slightly acid. The C horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. It is loam, sandy loam, or silt loam and is neutral or mildly alkaline.

Chagrin Variant

The Chagrin Variant consists of moderately deep, well drained, moderately permeable soils on flood plains. These soils formed in recent loamy alluvium over hard limestone bedrock. Slopes range from 0 to 2 percent.

Chagrin Variant soils are similar to Chagrin soils and are commonly adjacent to Lobdell and Orrville soils. Chagrin soils are deeper to bedrock than the Chagrin Variant soils. Lobdell soils have low chroma mottles within a depth of 20 inches. They are on the lower lying parts of the landscape. Orrville soils have a low chroma matrix directly below the A horizon. They are on the lower lying parts of the landscape.

Typical pedon of Chagrin Variant silt loam, frequently flooded, in a cultivated field, 800 feet south and 2,200 feet east of the northwest corner of sec. 9, T. 8 N., R. 9 E.

Ap—0 to 7 inches; dark brown (10YR 4/3) silt loam, light brownish gray (10YR 6/2) dry; moderate fine granular structure; friable; slightly acid; abrupt smooth boundary.

B21—7 to 21 inches; dark brown (10YR 4/3) silt loam; weak fine subangular blocky structure; friable; thin continuous dark brown (10YR 4/3) organic coatings on faces of peds; neutral; clear wavy boundary.

B22—21 to 25 inches; brown (10YR 4/3) loam; weak fine subangular blocky structure; friable; thin discontinuous dark brown (10YR 4/3) organic coatings on faces of peds; neutral; abrupt smooth boundary.

R—25 inches; very pale brown (10YR 7/3) hard limestone bedrock.

The thickness of the solum is 20 to 40 inches and is the same as the depth to bedrock. The Ap horizon is brown or dark brown (10YR 4/3) or dark grayish brown (10YR 4/2) silt loam or loam. It is neutral or slightly acid. The B2 horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. It is silt loam or loam. It is slightly acid or neutral.

Cincinnati series

The Cincinnati series consists of deep, well drained soils on ridgetops and side slopes on till plains in the uplands. These soils have a fragipan. They formed in loess and glacial drift and the underlying glacial till. Permeability is moderate above the fragipan and slow in the pan. Slopes range from 2 to 12 percent.

The Cincinnati soils in this county have a higher content of clay in the lower part of the subsoil than is defined as the range for the series. This difference, however, does not alter the use or behavior of the soils.

Cincinnati soils are similar to Hickory soils and are commonly adjacent to Grayford, Hickory, Rossmoyne, and Ryker soils. Hickory, Grayford, and Ryker soils do not have a fragipan. Hickory soils are more sloping than the Cincinnati soils. Also, their solum contains less silt. Grayford and Ryker soils have a lower horizon that formed in residuum of limestone bedrock. They generally are on the lower lying parts of the landscape. Rossmoyne soils have low chroma mottles above the fragipan. They generally are less sloping than the Cincinnati soils.

Typical pedon of Cincinnati silt loam, 6 to 12 percent slopes, eroded, in a cultivated field, 1,100 feet east and 100 feet south of the northwest corner of sec. 4, T. 8 N., R. 9 E.

Ap—0 to 8 inches; dark brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; moderate fine granular structure; friable; about 10 percent yellowish brown (10YR 5/4) subsoil material; slightly acid; abrupt smooth boundary.

B21t—8 to 19 inches; yellowish brown (10YR 5/6) silty clay loam; moderate medium subangular blocky structure; firm; thin continuous dark yellowish brown (10YR 4/4) clay films on faces of peds; thin discontinuous pale brown (10YR 6/3) silt films on faces of peds; strongly acid; clear wavy boundary.

B22t—19 to 26 inches; yellowish brown (10YR 5/4) silty clay loam; strong coarse prismatic structure parting to strong medium subangular blocky; very firm; thin continuous dark brown (7.5YR 4/4) clay films on faces of peds and in pores; thin continuous light brownish gray (10YR 6/2) silt films on faces of peds; strongly acid; clear wavy boundary.

Bx1—26 to 34 inches; yellowish brown (10YR 5/4) silty clay loam; strong very coarse prismatic structure; very firm; brittle; thin continuous dark brown (7.5YR 4/4) clay films on faces of peds and in pores; thin continuous light brownish gray (10YR 6/2) silt films on faces of peds and in pores; strongly acid; clear wavy boundary.

IIBx2—34 to 43 inches; yellowish brown (10YR 5/4) loam; strong very coarse prismatic structure; very firm; brittle; thin continuous dark brown (7.5YR 4/4) and grayish brown (10YR 5/2) clay films on faces of peds and in pores; thin continuous light brownish gray (10YR 6/2) silt films on faces of peds and in pores; about 1 percent gravel; strongly acid; clear wavy boundary.

IIBx3—43 to 60 inches; brown (7.5YR 4/4) clay; strong very coarse prismatic structure; very firm; brittle; thin continuous yellowish brown (10YR 5/4) clay films on faces of peds and in pores; thin discontinuous light brownish gray (10YR 6/2) silt films on faces of peds and in pores; strongly acid; gradual wavy boundary.

IIIB3t—60 to 80 inches; brown (7.5YR 4/4) clay loam; moderate fine subangular blocky structure; firm; thin continuous dark yellowish brown (10YR 4/4) clay films on faces of peds; medium acid.

The solum is 48 to 110 inches thick. The loess is 18 to 40 inches thick. The depth to the fragipan ranges from 18 to 38 inches.

The Ap horizon is dark brown (10YR 4/3) or brown (10YR 5/3). It is strongly acid to neutral. The B horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6. The B2t and Bx1 horizons are silt loam or silty clay loam. They are strongly acid or very strongly acid. The IIBx2 horizon is loam or clay loam. It is strongly acid or very strongly acid. The IIBx3 horizon is clay or clay loam. The IIIB3 horizon is clay loam or loam. It is strongly acid to slightly acid.

Clermont series

The Clermont series consists of deep, poorly drained, very slowly permeable soils on loess covered till plains in the uplands. These soils formed in loess and glacial drift. Slopes are 0 to 1 percent.

The Clermont soils in this county have a lower content of clay in the argillic horizon than is defined as the range for the series. This difference, however, does not alter the use or behavior of the soils.

Clermont soils are commonly adjacent to Avonburg soils. Avonburg soils are somewhat poorly drained. They have a fragipan.

Typical pedon of Clermont silt loam, in a cultivated field, 1,760 feet west and 660 feet north of the southeast corner of sec. 17, T. 10 N., R. 11 E.

Ap—0 to 6 inches; grayish brown (10YR 5/2) silt loam, light gray (10YR 7/1) dry; many fine faint brown (10YR 5/3) mottles; moderate fine granular structure; friable; common fine roots; many fine dark brown (7.5YR 4/4) iron and manganese oxide stains; neutral; abrupt smooth boundary.

A21—6 to 10 inches; light gray (10YR 6/1) silt loam; common fine faint light brownish gray (10YR 6/2) mottles; weak thin platy structure; friable; common fine roots; common fine pores; many fine dark brown (7.5YR 4/4) iron and manganese oxide stains; medium acid; abrupt wavy boundary.

A22—10 to 15 inches; light gray (10YR 6/1) silt loam; common fine faint light brownish gray (10YR 6/2) mottles; weak thick platy structure; friable; common fine roots; many very fine pores; strongly acid; clear wavy boundary.

A23—15 to 19 inches; light gray (10YR 6/1) silt loam; many medium distinct yellowish brown (10YR 5/6) mottles; moderate thick platy structure parting to moderate fine subangular blocky; firm; few fine roots; many very fine pores; discontinuous light gray (10YR 7/1) silt coatings on faces of peds; very few small chert fragments; very strongly acid; clear wavy boundary.

B2tg—19 to 27 inches; light gray (10YR 6/1) silt loam; common medium distinct yellowish brown (10YR 5/6) mottles; moderate very coarse prismatic structure parting to moderate medium subangular blocky; firm; about 50 percent brittle; many very fine pores; thin discontinuous light brownish gray (10YR 6/2) clay films on faces of peds; many discontinuous light gray (10YR 7/2) silt films on faces of peds; common light brownish gray (10YR 6/2) krotovinas; common fine dark brown (7.5YR 4/4) iron and manganese oxide stains; very few small chert fragments; very strongly acid; clear wavy boundary.

IIBx1g—27 to 43 inches; light gray (10YR 6/1) silt loam; moderate very coarse prismatic structure parting to weak very thick platy; firm; about 50 percent brittle; many very fine inped vesicular pores; thin discontinuous light brownish gray (10YR 6/2) clay films on faces of peds; thick continuous light gray (10YR 7/2) silt films on faces of peds; common fine black (10YR 2/1) iron and manganese oxide accumulations; common fine dark brown (7.5YR 4/4) iron and manganese oxide stains; few coarse sand grains; strongly acid; clear wavy boundary.

IIBx2g—43 to 66 inches; light gray (10YR 6/1) silt loam; many medium distinct strong brown (7.5YR 5/6) mottles; moderate very coarse prismatic structure parting to weak coarse subangular blocky; firm; about 50 percent brittle; many very fine pores; thin continuous light brownish gray (10YR 6/2) clay films on faces of peds; thick continuous light gray (10YR 7/2) silt films on faces of peds; common light brownish gray (10YR 6/2) krotovinas; common fine dark brown (7.5YR 4/4) iron and manganese oxide stains; few coarse sand grains; slightly acid; clear wavy boundary.

IIB3t—66 to 80 inches; yellowish brown (10YR 5/6) silt loam; many fine distinct light gray (10YR 6/1) mottles; weak coarse subangular blocky structure; firm; thin discontinuous dark grayish brown (10YR 4/2) and grayish brown (10YR 5/2) clay films and silt films on faces of peds; medium discontinuous light gray (10YR 6/1) silt films on faces of peds; few very fine pebbles; neutral.

The solum is 80 to 110 inches thick. The loess is 24 to 60 inches thick. The glacial drift is 80 or more inches thick. A firm, brittle horizon is at a depth of 18 to 29 inches.

The Ap horizon is dark grayish brown (10YR 4/2),

grayish brown (10YR 5/2), or gray (10YR 6/1). It ranges from neutral to medium acid. The A2 horizon has hue of 10YR, value of 6, and chroma of 1 or 2. It is very strongly acid to medium acid. The B2t and IIBx horizons are silt loam or silty clay loam. They have hue of 10YR, value of 6, and chroma of 1 or 2 and are mottled. The IIB3t horizon has hue of 10YR, value of 4 to 6, and chroma of 1 to 6. This horizon is silt loam or silty clay loam.

Corydon series

The Corydon series consists of shallow, well drained, moderately permeable soils on side slopes and head slopes. These soils formed in silty glacial till over limestone bedrock. Slopes range from 15 to 35 percent.

The Corydon soils in this county do not have a mollic epipedon. Also, they have a lower content of clay throughout than is defined as the range for the series. These differences, however, do not alter the use or behavior of the soils.

Corydon soils are similar to Milton soils and are commonly adjacent to Milton, Grayford, and Hennepin soils. Milton and Grayford soils have an argillic horizon. Their solum is thinner than that of the Corydon soils. Milton soils are 20 to 40 inches deep over bedrock. They are more clayey than the Corydon soils. Grayford soils are higher on the landscape than the Corydon soils. Also, they are more clayey in the subsoil, have a loess mantle, and are redder in the lower part of the subsoil. Hennepin soils are deeper to bedrock than the Corydon soils. They are in positions on the landscape similar to those of the Corydon soils.

Typical pedon of Corydon silt loam, in an area of Corydon-Rock outcrop complex, 15 to 35 percent slopes, in a wooded area, 600 feet east and 1,450 feet south of the northwest corner of sec. 12, T. 11 N., R. 8 E.

A1—0 to 3 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; weak medium granular structure; friable; neutral; clear wavy boundary.

B2—3 to 15 inches; dark brown (10YR 4/3) silt loam; moderate coarse granular structure; friable; about 8 percent limestone fragments; neutral; abrupt wavy boundary.

R—15 inches; light gray (10YR 7/2) hard limestone bedrock.

The thickness of the solum is 10 to 20 inches and is the same as the depth to bedrock. The A1 horizon is very dark grayish brown (10YR 3/2) or dark brown (10YR 3/3) loam or silt loam. The B2 horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. It is neutral to medium acid and is loam or silt loam. The content of limestone fragments and fine gravel in this horizon ranges from 0 to 35 percent.

Crosby series

The Crosby series consists of deep, somewhat poorly drained, slowly permeable soils on loess covered glacial till plains. These soils formed in loess and the underlying loamy glacial till. Slopes range from 0 to 3 percent.

The Crosby soils in this county have a lower content of clay in the subsoil than is defined as the range for the series. This difference, however, does not alter the use or behavior of the soils.

Crosby soils are similar to Fincastle soils and are commonly adjacent to Cyclone and Williamstown soils. Fincastle soils are in positions on the landscape similar to those of the Crosby soils. They have a lower content of sand in the upper part of the subsoil than the Crosby soils. Also, their solum is thicker. Cyclone soils have a mollic epipedon. They are in depressions. They are grayer throughout than the Crosby soils. Also, their surface soil is thicker. Williamstown soils are browner in the subsurface layer and upper part of the subsoil than the Crosby soils. They are on the higher swells.

Typical pedon of Crosby silt loam, 0 to 3 percent slopes, in a cultivated field, 450 feet east and 50 feet south of the northwest corner of sec. 1, T. 11 N., R. 8 E.

Ap—0 to 6 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; common fine distinct grayish brown (10YR 5/2) and light yellowish brown (10YR 6/4) mottles; moderate medium granular structure; friable; many fine roots; neutral; abrupt smooth boundary.

A2—6 to 10 inches; grayish brown (10YR 5/2) silt loam; few fine distinct yellowish brown (10YR 5/6) mottles; weak thick platy structure; friable; few fine and very fine roots; neutral; clear wavy boundary.

B21t—10 to 13 inches; light brownish gray (10YR 6/2) clay loam; few medium distinct yellowish brown (10YR 5/6) mottles; weak fine subangular blocky structure; firm; neutral; clear wavy boundary.

B22t—13 to 16 inches; grayish brown (10YR 5/2) clay loam; many medium distinct yellowish brown (10YR 5/4) mottles; moderate medium subangular blocky structure; firm; thin continuous grayish brown (10YR 5/2) clay films on faces of peds; many fine distinct dark yellowish brown (10YR 3/4) iron and manganese oxide stains; neutral; clear wavy boundary.

B23t—16 to 27 inches; yellowish brown (10YR 5/4) clay loam; common medium distinct grayish brown (10YR 5/2) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; firm; thin continuous dark grayish brown (10YR 4/2) clay films on faces of peds; neutral; gradual wavy boundary.

B3—27 to 33 inches; yellowish brown (10YR 5/4) loam; many medium distinct light yellowish brown (10YR 6/4) and common medium distinct grayish brown (10YR 5/2) mottles; weak coarse subangular blocky structure; firm; thin discontinuous grayish brown (10YR 5/2) clay films on faces of peds; neutral; clear wavy boundary.

C—33 to 60 inches; brown (10YR 5/3) loam; massive; firm; few fine distinct dark yellowish brown (10YR 3/4) iron oxide stains; slight effervescence; mildly alkaline.

The solum is 27 to 40 inches thick. The loess is 5 to 18 inches thick.

The Ap horizon is dark grayish brown (10YR 4/2) or grayish brown (10YR 5/2). It ranges from neutral to medium acid. The A2 horizon is grayish brown (10YR 5/2) or light brownish gray (10YR 6/2) silt loam, loam, or clay loam. The B2t horizon has hue of 10YR, value of 4 to 6, and chroma of 2 to 6 and is distinctly mottled. It is clay loam, silty clay loam, or loam. It is neutral or slightly acid. The B3 horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 6. It is loam or clay loam. It is slightly acid to mildly alkaline. The C horizon is sandy loam or loam. It is mildly alkaline or moderately alkaline.

Cyclone series

The Cyclone series consists of deep, poorly drained, moderately permeable soils on glacial till plains. These soils formed in silty loess and loamy glacial till. Slopes range from 0 to 2 percent.

Cyclone soils are similar to Milford and Montgomery soils and are commonly adjacent to Crosby and Fincastle soils. Milford and Montgomery soils are more clayey throughout than the Cyclone soils. Crosby and Fincastle soils are somewhat poorly drained and are on the higher lying parts of the landscape.

Typical pedon of Cyclone silt loam, in a cultivated field, 60 feet east and 2,500 feet south of the northwest corner of sec. 36, T. 12 N., R. 8 E.

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) silt loam, dark gray (10YR 4/1) dry; moderate medium granular structure; friable; neutral; abrupt smooth boundary.

A12—9 to 16 inches; dark olive gray (5Y 3/2) silt loam, gray (5YR 5/1) dry; common coarse distinct dark grayish brown (2.5Y 4/2) mottles; weak fine prismatic structure parting to moderate fine subangular blocky; friable; common fine dark brown (7.5YR 4/4) iron and manganese oxide accumulations; neutral; clear wavy boundary.

B21tg—16 to 27 inches; very dark gray (10YR 3/1) silty clay loam, gray (10YR 6/1) dry; common fine distinct yellowish brown (10YR 5/4) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; firm; thin continuous gray (10YR 5/1) clay films on faces of peds and lining pores; neutral; clear wavy boundary.

B22tg—27 to 46 inches; brown (10YR 5/3) silty clay loam; many fine distinct gray (10YR 5/1) mottles; moderate medium prismatic structure parting to moderate coarse subangular blocky; firm; thin continuous dark grayish brown (10YR 4/2) clay films on faces of peds and lining pores; neutral; clear wavy boundary.

B31t—46 to 52 inches; brown (10YR 5/3) silt loam; many fine distinct grayish brown (10YR 5/2) mottles; weak coarse subangular blocky structure; firm; thin discontinuous dark grayish brown (10YR 4/2) clay films on faces of peds; about 2 percent fine gravel; neutral; clear wavy boundary.

IIB32—52 to 60 inches; yellowish brown (10YR 5/4) loam; many fine distinct dark grayish brown (10YR 4/2) mottles; weak coarse subangular blocky structure; firm; about 3 percent gravel; neutral; clear wavy boundary.

IIC—60 to 65 inches; brown (10YR 5/3) loam; massive; firm; common fine very dark gray (10YR 3/1) iron and manganese oxide accumulations; about 3 percent gravel; strong effervescence; mildly alkaline.

The solum is 55 to 65 inches thick. It is neutral or mildly alkaline. The mollic epipedon is 10 to 18 inches thick. The loess is 40 to 60 inches thick.

The A horizon has hue of 10YR or 5Y, value of 3, and chroma of 1 or 2. It is silt loam or silty clay loam. The B2 horizon has hue of 2.5Y or 10YR, value of 3 to 5, and chroma of 1 to 3. It has few to many mottles. The IIB3 horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 4. It is loam or clay loam. The IIC horizon has hue of 10YR, value of 5 or 6, and chroma of 2 to 4. It is sandy loam or loam. It is mildly alkaline or moderately alkaline.

Fincastle series

The Fincastle series consists of deep, somewhat poorly drained soils on loess covered glacial till plains. These soils are moderately slowly permeable in the subsoil and slowly permeable in the substratum. They formed in loess and the underlying loamy glacial till. Slopes range from 0 to 4 percent.

The Fincastle soils in this county have a higher content of clay in the upper part of the argillic horizon and are less acid in the B2t horizon than is defined as the range for the series. These differences, however, do not alter the use or behavior of the soils.

Fincastle soils are similar to Crosby and Starks soils and are commonly adjacent to Cyclone, Williamstown, and Xenia soils. Crosby soils contain more sand in the upper part of the subsoil than the Fincastle soils. Also, they formed in thinner deposits of loess and have a thinner solum. Starks soils formed in loess and the underlying outwash. Cyclone soils are in depressions. They are grayer throughout than the Fincastle soils. Also, their surface layer is thicker and darker. Williamstown and Xenia soils do not have a grayish matrix color in the subsurface layer or the upper part of the subsoil. They are higher on the landscape than the Fincastle soils. Also, Williamstown soils formed in thinner loess deposits and have a thinner solum.

Typical pedon of Fincastle silt loam, 0 to 2 percent slopes, in a cultivated field, 480 feet east and 1,500 feet north of the center of sec. 10, T. 9 N., R. 8 E.

Ap—0 to 8 inches; grayish brown (10YR 5/2) silt loam, light brownish gray (10YR 6/2) dry; moderate medium granular structure; friable; neutral; abrupt smooth boundary.

A2—8 to 10 inches; grayish brown (10YR 5/2) silt loam; common fine distinct yellowish brown (10YR 5/6) mottles; weak medium platy structure; friable; many fine very dark brown (10YR 2/2) iron and manganese oxide accumulations; neutral; clear wavy boundary.

B21t—10 to 27 inches; yellowish brown (10YR 5/4) silty clay loam; many fine distinct grayish brown (10YR 5/2) mottles; moderate medium subangular blocky structure; firm; thin continuous dark grayish brown (10YR 4/2) clay films on faces of peds; common fine very dark brown (10YR 2/2) iron and manganese oxide accumulations; neutral; clear wavy boundary.

IIB22t—27 to 42 inches; yellowish brown (10YR 5/4) loam; many fine distinct grayish brown (10YR 5/2) mottles; moderate medium and coarse subangular blocky structure; firm; thin continuous dark grayish brown (10YR 4/2) clay films on faces of peds; neutral; clear wavy boundary.

IIB3t—42 to 54 inches; yellowish brown (10YR 5/4) loam; many fine distinct grayish brown (10YR 5/2) mottles; weak coarse subangular blocky structure; firm; thin continuous dark grayish brown (10YR 4/2) clay films on faces of peds; slight effervescence; mildly alkaline; clear wavy boundary.

IIC—54 to 60 inches; yellowish brown (10YR 5/4) loam; common fine distinct grayish brown (10YR 5/2) mottles; massive; firm; strong effervescence; moderately alkaline.

The solum is 40 to 60 inches thick. The loess is 20 to 40 inches thick.

The Ap horizon is dark grayish brown (10YR 4/2) or grayish brown (10YR 5/2). It is neutral to medium acid, depending on past liming practices. The A1 horizon, if it occurs, is very dark grayish brown (10YR 3/2) and has weak to moderate, fine to medium granular structure. The A2 horizon is light brownish gray (10YR 6/2) or grayish brown (10YR 5/2).

The B2t and IIB2t horizons have hue of 10YR, value of 4 to 6, and chroma of 2 to 4 and are distinctly mottled. They are silty clay loam, loam, or silt loam. They are neutral to medium acid. The IIB3t horizon has hue of 10YR, value of 4 to 6, and chroma of 2 to 4. It is loam or clay loam. It is neutral to moderately alkaline.

The IIC horizon has hue of 10YR, value of 5, and chroma of 3 or 4. It is fine sandy loam or loam. It is mildly alkaline or moderately alkaline.

Fox series

The Fox series consists of deep, well drained soils on outwash plains, terraces, and kames. These soils are underlain by very gravelly coarse sand. They are moderately permeable in the subsoil and rapidly permeable in the underlying material. They formed in loamy outwash material. Slopes range from 0 to 6 percent.

Fox soils are similar to Montgomery, Ockley, and Rodman soils and are commonly adjacent to those soils. The solum of Montgomery and Ockley soils is more than 40 inches thick. Montgomery and Rodman soils have a mollic epipedon. Montgomery soils are grayer throughout than the Fox soils. They do not have an argillic horizon. They are in depressions.

Typical pedon of Fox loam, 0 to 2 percent slopes, in a cultivated field, 750 feet east and 800 feet south of the northwest corner of sec. 5, T. 11 N., R. 9 E.

Ap—0 to 10 inches; dark grayish brown (10YR 4/2) loam, pale brown (10YR 6/3) dry; moderate fine granular structure; friable; about 9 percent gravel; neutral; abrupt smooth boundary.

B21t—10 to 21 inches; dark brown (7.5YR 4/4) gravelly loam; moderate medium subangular blocky structure; firm; thin continuous dark brown (7.5YR 4/2) clay films on faces of peds; about 16 percent gravel; neutral; clear wavy boundary.

B22t—21 to 30 inches; dark brown (7.5YR 4/4) gravelly sandy clay loam; moderate medium subangular blocky structure; firm; thin and medium continuous dark brown (7.5YR 3/2) clay films on faces of peds; about 21 percent gravel; neutral; abrupt wavy boundary.

C—30 to 60 inches; dark brown (10YR 4/3) very gravelly coarse sand; single grain; loose; about 66 percent gravel; strong effervescence; moderately alkaline.

The solum is 30 to 39 inches thick. The Ap horizon has hue of 10YR, value of 4, and chroma of 2 or 3. It is loam or silt loam. It is neutral or slightly acid. The B2t

horizon has hue of 7.5YR or 10YR, value of 4, and chroma of 3 or 4. It is loam, sandy clay loam, clay loam, or the gravelly analogs of these textures. It is neutral or slightly acid in the upper part and neutral in the lower part. The C horizon has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 2 to 6. It is gravelly or very gravelly coarse sand or sand. It is mildly alkaline or moderately alkaline and is slightly or strongly effervescent.

Grayford series

The Grayford series consists of deep, well drained, moderately permeable soils on side slopes and back slopes in the uplands. These soils formed in loess and in the underlying glacial till and residuum of cherty limestone. Slopes range from 4 to 20 percent.

Grayford soils are similar to Hickory, Milton, and Ryker soils and are commonly adjacent to Cincinnati, Corydon, and Rossmoyne soils on the higher ridges. Cincinnati, Hickory, and Rossmoyne soils did not form in material weathered from limestone. Also, Cincinnati and Rossmoyne soils have a fragipan. The solum of Corydon and Milton soils is thinner than that of the Grayford soils. The solum of Milton soils is less acid than that of the Grayford soils, and the lower part formed in more recent till. Ryker soils are deeper to bedrock than the Grayford soils. Also, their solum and their loess mantle are thicker.

Typical pedon of Grayford silt loam, 10 to 20 percent slopes, in a wooded area, 100 feet east and 1,510 feet south of the northwest corner of sec. 29, T. 9 N., R. 10 E.

A1—0 to 3 inches; very dark grayish brown (10YR 3/2) silt loam, pale brown (10YR 6/3) dry; moderate fine granular structure; friable; medium acid; abrupt wavy boundary.

A2—3 to 7 inches; light yellowish brown (10YR 6/4) silt loam; moderate fine granular structure; friable; strongly acid; clear wavy boundary.

IIB21t—7 to 19 inches; yellowish brown (10YR 5/4) clay loam; moderate fine and medium subangular blocky structure; firm; thin continuous dark brown (7.5YR 4/4) clay films on faces of peds and in pores; strongly acid; clear wavy boundary.

IIB22t—19 to 24 inches; yellowish brown (10YR 5/4) clay loam; moderate medium subangular blocky structure; firm; thin continuous dark brown (7.5YR 4/4) clay films on faces of peds and in pores; very strongly acid; clear wavy boundary.

IIB23t—24 to 40 inches; reddish brown (5YR 4/3) clay loam; moderate coarse subangular blocky structure; firm; thin continuous dark reddish brown (5YR 3/3) clay films on faces of peds and in pores; strongly acid; gradual wavy boundary.

IIIB24t—40 to 48 inches; reddish brown (2.5YR 4/4) clay; moderate coarse angular blocky structure; firm; thin discontinuous dusky red (2.5YR 3/2) clay films on faces of peds and in pores; about 10 percent chert fragments; strongly acid; abrupt wavy boundary.

IIIR—48 inches; light gray (10YR 7/2) hard limestone.

The thickness of the solum is 40 to 60 inches and is the same as the depth to bedrock. The loess is 6 to 24 inches thick. Clayey residuum, if it occurs, is at a depth of 35 to 55 inches.

The A1 horizon has hue of 10YR, value of 3 or 4, and chroma of 2 or 3. The Ap horizon, if it occurs, has hue of 10YR, value of 3 to 5, and chroma of 3 or 4. The A horizon is strongly acid to neutral, depending on past liming practices.

Some pedons have a B2t horizon. This horizon formed in loess. It has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6. It is silty clay loam or silt loam. The IIB2 horizon has hue of 5YR to 10YR, value of 4 or 5, and chroma of 3 to 8. It is loam, clay loam, silty clay loam, or silt loam. It is strongly acid or very strongly acid. The content of chert fragments in the IIIB2 horizon ranges from 5 to 35 percent. The IIIB2t horizon and the IIIB3 horizon, if it occurs, have hue of 2.5YR to 7.5YR, value of 4 or 5, and chroma of 4 to 8. They are very strongly acid to neutral. They are silty clay, clay loam, or clay. They are local till derived from the residuum or are in-place residuum.

Hennepin series

The Hennepin series consists of deep, well drained soils on side slopes on glacial till plains and moraines. These soils are moderately permeable in the subsoil and moderately slowly permeable in the substratum. They formed in loamy till. Slopes range from 35 to 60 percent.

Hennepin soils are similar to Corydon, Hickory, and Rodman soils and are commonly adjacent to Miami and Russell soils. Corydon soils are underlain by limestone bedrock at a depth of 10 to 20 inches. They are along bedrock escarpments. Hickory, Miami, and Russell soils generally are less sloping than the Hennepin soils. Also, their subsoil is more clayey and their solum is thicker. Hickory and Rodman soils are in positions on the landscape similar to those of the Hennepin soils. Also, Rodman soils formed in gravelly outwash.

Typical pedon of Hennepin loam, 35 to 60 percent slopes, in a wooded area, 1,350 feet west and 1,140 feet north of the southeast corner of sec. 7, T. 11 N., R. 9 E.

A1—0 to 3 inches; dark grayish brown (10YR 4/2) loam, grayish brown (10YR 5/2) dry; moderate fine granular structure; friable; about 2 percent gravel; neutral; clear smooth boundary.

B2—3 to 17 inches; yellowish brown (10YR 5/4) loam; weak fine subangular blocky structure; firm; about 3 percent gravel; neutral; clear wavy boundary.

C—17 to 60 inches; pale brown (10YR 6/3) loam; massive; firm; about 5 percent gravel; strong effervescence; moderately alkaline.

The solum is 10 to 20 inches thick. The A horizon is very dark grayish brown (10YR 3/2) or dark grayish brown (10YR 4/2). It is neutral or slightly acid. The A2 horizon, if it occurs, has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. It is loam that has weak, thin or medium platy structure. It is slightly acid to mildly alkaline. The B horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. It is slightly acid to moderately alkaline. The C horizon has hue of 10YR, value of 5 or 6, and chroma of 3 or 4. It is sandy loam or loam. It is mildly alkaline or moderately alkaline.

Hickory series

The Hickory series consists of deep, well drained, moderately permeable soils in the uplands. These soils formed in loamy glacial till. Slopes range from 12 to 50 percent.

Hickory soils are similar to Hennepin and Miami soils and are commonly adjacent to Cincinnati, Grayford, and Ryker soils. The solum of Hennepin and Miami soils is thinner than that of the Hickory soils. Also, Hennepin soils generally are more sloping, are less clayey, and do not have an argillic horizon. The loess mantle of Cincinnati and Ryker soils is thicker than that of the Hickory soils. Cincinnati soils have a fragipan. They are less sloping than the Hickory soils. Also, their solum is thicker. Grayford and Ryker soils are on the lower parts of the landscape. They are leached to a greater depth than the Hickory soils. Also, the lower part of their solum is redder and more clayey and formed in till and residuum of cherty limestone. Grayford soils have bedrock within a depth of 60 inches.

Typical pedon of Hickory loam, 18 to 25 percent slopes, eroded, in a pasture, 500 feet west and 430 feet north of the center of sec. 33, T. 11 N., R. 11 E.

Ap—0 to 5 inches; dark brown (10YR 4/3) loam, brown (10YR 5/3) dry; moderate fine granular structure; friable; slightly acid; abrupt smooth boundary.

B21t—5 to 11 inches; yellowish brown (10YR 5/6) clay loam; moderate medium subangular blocky structure; firm; thin continuous dark brown (7.5YR 4/4) clay films on faces of peds; strongly acid; clear wavy boundary.

B22t—11 to 35 inches; strong brown (7.5YR 5/6) clay loam; moderate coarse subangular blocky structure; firm; thin continuous brown (7.5YR 5/4) clay films on faces of peds; strongly acid; gradual wavy boundary.

B23t—35 to 43 inches; strong brown (7.5YR 5/6) clay loam; moderate coarse subangular blocky structure; firm; thin continuous dark yellowish brown (10YR 4/4) clay films on faces of peds; strongly acid; clear wavy boundary.

B3t—43 to 52 inches; yellowish brown (10YR 5/4) clay loam; weak coarse subangular blocky structure; firm; thin discontinuous dark yellowish brown (10YR 4/4) clay films on faces of peds; medium acid; clear wavy boundary.

C—52 to 60 inches; yellowish brown (10YR 5/4) loam; massive; firm; strong effervescence; moderately alkaline.

The solum is 40 to 72 inches thick. The loess is 0 to 18 inches thick.

The A horizon is loam or silt loam. It is strongly acid to neutral. The Ap horizon is dark brown (10YR 4/3), brown (10YR 5/3), or dark grayish brown (10YR 4/2) unless it is severely eroded. The A1 horizon, if it occurs, is very dark grayish brown (10YR 3/2) loam or silt loam. The A2 horizon, if it occurs, is grayish brown (10YR 5/2), brown (10YR 5/3), or pale brown (10YR 6/3). It has weak or moderate, thin to thick platy structure.

The B2t horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6. It is clay loam, silty clay loam, silt loam, or loam. It is very strongly acid to medium acid. The B3t horizon has hue of 10YR or 7.5YR, value of 5, and chroma of 4 to 6. It is clay loam or loam. It is strongly acid or medium acid.

The C horizon is brown (10YR 5/3) or yellowish brown (10YR 5/4) clay loam or loam. It is neutral to moderately alkaline.

Lobdell series

The Lobdell series consists of deep, moderately well drained, moderately permeable soils on flood plains. These soils formed in recent alluvium. Slopes range from 0 to 2 percent.

The Lobdell soils in this county have a slightly lower content of clay in the control section than is defined as the range for the series. This difference, however, does not alter the use or behavior of the soils.

Lobdell soils are commonly adjacent to Chagrin and Orrville soils. Chagrin soils are browner throughout than the Lobdell soils. Orrville soils generally are lower on the landscape than the Lobdell soils. Also, the upper part of their subsoil is grayer.

Typical pedon of Lobdell silt loam, frequently flooded, in a cultivated field, 300 feet west and 2,280 feet south of the northeast corner of sec. 27, T. 10 N., R. 8 E.

Ap—0 to 8 inches; dark brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; moderate fine granular structure; friable; neutral; abrupt smooth boundary.

B21—8 to 17 inches; brown (10YR 4/3) silt loam; weak fine subangular blocky structure; friable; discontinuous dark brown (10YR 4/3) organic coatings on faces of peds; slightly acid; clear wavy boundary.

B22—17 to 30 inches; brown (10YR 4/3) loam; common fine faint grayish brown (10YR 5/2) mottles; weak fine subangular blocky structure; friable; continuous dark brown (10YR 3/3) organic coatings on faces of peds; neutral; clear wavy boundary.

B23—30 to 40 inches; brown (10YR 4/3) loam; common fine faint grayish brown (10YR 5/2) mottles; weak fine subangular blocky structure; friable; continuous dark brown (10YR 4/3) organic coatings on faces of peds; neutral; clear wavy boundary.

C—40 to 60 inches; yellowish brown (10YR 5/4) fine sandy loam; many fine distinct grayish brown (10YR 5/2) mottles; massive; very friable; neutral.

The solum is 30 to 50 inches thick. The Ap horizon is dark brown (10YR 4/3) or dark grayish brown (10YR 4/2) silt loam or loam. The B2 horizon is loam, silt loam, or fine sandy loam. It is neutral or slightly acid. It has hue of 10YR and value of 4 or 5. It generally has chroma of 3 or 4, but in some pedons the B23 horizon has chroma of 1 or 2. The C horizon has hue of 10YR, value of 4 to 6, and chroma of 1 to 4. It is neutral or mildly alkaline. It is stratified loam, silt loam, fine sandy loam, or loamy sand.

Martinsville series

The Martinsville series consists of deep, well drained, moderately permeable soils on outwash plains and kames. These soils formed in loamy outwash. Slopes range from 0 to 6 percent.

Martinsville soils are similar to Fox, Miami, and Ockley soils and are commonly adjacent to those soils. Fox and Ockley soils contain more gravel throughout than the Martinsville soils. They are in positions on the landscape similar to those of the Martinsville soils. The solum of Fox and Miami soils is thinner than that of the Martinsville soils. Miami soils formed in a thin mantle of loess and in the underlying glacial till. They are higher on the landscape than the Martinsville soils or are on similar parts of the landscape.

Typical pedon of Martinsville loam, 2 to 6 percent slopes, eroded, in a cultivated field, 2,310 feet east and 330 feet north of the southwest corner of sec. 20, R. 11 N., R. 9 E.

Ap—0 to 7 inches; dark brown (10YR 4/3) loam, light gray (10YR 7/2) dry; moderate fine granular structure; friable; slightly acid; abrupt smooth boundary.

B1t—7 to 9 inches; yellowish brown (10YR 5/4) silty clay loam; weak fine subangular blocky structure; firm; thin discontinuous dark yellowish brown (10YR 4/4) clay films on faces of peds; slightly acid; clear smooth boundary.

B21t—9 to 22 inches; yellowish brown (10YR 5/6) clay loam; moderate fine subangular blocky structure; firm; thin continuous dark yellowish brown (10YR 4/4) clay films on faces of peds; strongly acid; clear wavy boundary.

B22t—22 to 44 inches; yellowish brown (10YR 5/4) clay loam; moderate medium subangular blocky structure; firm; thin continuous dark yellowish brown (10YR 4/4) clay films on faces of peds; medium acid; gradual wavy boundary.

B23t—44 to 70 inches; yellowish brown (10YR 5/6) loam; moderate coarse subangular blocky structure; friable; medium acid; gradual wavy boundary.

C—70 to 75 inches; yellowish brown (10YR 5/4) stratified fine sandy loam; friable; slight effervescence; moderately alkaline.

The solum is 40 to 70 inches thick. The loess is 0 to 16 inches thick.

The Ap horizon is dark grayish brown (10YR 4/2), dark brown (10YR 4/3), brown (10YR 5/3), or yellowish brown (10YR 5/4). It is loam or silt loam. It is medium acid to neutral. The A2 horizon, if it occurs, is brown (10YR 4/3 or 5/3) loam or silt loam. It is slightly acid or medium acid.

The B1 horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 5. It is loam, silty clay loam, or sandy loam. It is slightly acid or medium acid. The B2t horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 6. It is clay loam, loam, sandy loam, or sandy clay loam. It is strongly acid to slightly acid. The B3 horizon, if it occurs, has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 6. It is sandy clay loam or sandy loam. It is medium acid to neutral.

The C horizon has hue of 10YR, value of 5 or 6, and chroma of 3 or 4. It is mildly alkaline or moderately alkaline. It is silt loam, loam, fine sandy loam, coarse sandy loam, loamy coarse sand, coarse sand, or sand. The content of gravel-size coarse fragments in this horizon ranges from 0 to 10 percent.

Miami series

The Miami series consists of deep, well drained soils on loess covered summits, side slopes, shoulder slopes, and back slopes on glacial till plains in the uplands. These soils are moderately permeable in the subsoil and moderately slowly permeable in the substratum. They formed in a thin mantle of loess and the underlying loamy glacial till. Slopes range from 2 to 18 percent.

Miami soils are similar to Hickory and Russell soils and are commonly adjacent to Hennepin, Williamstown, and

Xenia soils. The solum of Hickory, Russell, and Xenia soils is thicker than that of the Miami soils. Also, Hickory soils are leached to a greater depth and are on older landscapes, and Russell and Xenia soils formed in a thicker deposit of loess. Russell and Xenia soils are in positions on the landscape similar to those of the Miami soils. Hennepin soils do not have an argillic horizon. They are steeper than the Miami soils. Also, their solum is thinner and less clayey. Williamstown and Xenia soils are on the lower parts of the landscape. The lower part of their solum is mottled.

Typical pedon of Miami silt loam, 2 to 6 percent slopes, eroded, in a cultivated field, 10 feet east and 1,110 feet south of the northwest corner of sec. 11, T. 10 N., R. 9 E.

Ap—0 to 7 inches; brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; weak fine granular structure; friable; few specks of yellowish brown (10YR 5/4) subsoil material; medium acid; abrupt smooth boundary.

IIB21t—7 to 14 inches; brown (7.5YR 4/4) silty clay loam; moderate fine subangular blocky structure; firm; thin continuous dark brown (7.5YR 4/4) clay films on faces of peds and pebbles; about 5 percent gravel; medium acid; clear wavy boundary.

IIB22t—14 to 18 inches; brown (7.5YR 4/4) clay loam; moderate medium subangular blocky structure; firm; thin continuous dark brown (7.5YR 4/4) clay films on faces of peds and pebbles; about 5 percent gravel; medium acid; clear wavy boundary.

IIB23t—18 to 30 inches; brown (7.5YR 4/4) clay loam; moderate coarse subangular blocky structure; firm; thin discontinuous dark brown (7.5YR 4/4) clay films on faces of peds and pebbles; about 5 percent gravel; medium acid; clear wavy boundary.

IIB3—30 to 35 inches; yellowish brown (10YR 5/4) loam; weak coarse subangular blocky structure; firm; thin discontinuous dark brown (10YR 4/3) clay films on faces of peds and pebbles; about 8 percent gravel; neutral; clear wavy boundary.

IIC—35 to 60 inches; pale brown (10YR 6/3) loam; massive; firm; about 15 percent gravel; strong effervescence; moderately alkaline.

The solum is 24 to 40 inches thick. The loess generally is 5 to 18 inches thick but is less than 5 inches thick in severely eroded areas.

The Ap horizon is dark grayish brown (10YR 4/2) or brown (10YR 4/3 or 5/3) silt loam unless it is severely eroded. It is medium acid to neutral. The A2 horizon, if it occurs, is yellowish brown (10YR 5/4) or brown (10YR 5/3) silt loam that has weak medium platy structure.

The B2t horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 6. The upper part is silty clay loam or clay loam and is strongly acid to slightly acid. The lower part is clay loam or loam and is medium acid to neutral. The B3 horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 6. It is loam or clay loam. It is slightly acid to mildly alkaline.

The C horizon has hue of 10YR, value of 5 or 6, and chroma of 3 or 4. It is sandy loam or loam. It is mildly alkaline or moderately alkaline.

Milford series

The Milford series consists of deep, poorly drained and very poorly drained, slowly permeable soils that are in depressions on lake plains. These soils formed in clayey lacustrine sediments. Slopes are 0 to 1 percent.

Milford soils are similar to Cyclone and Montgomery soils and are commonly adjacent to Cyclone soils. Cyclone soils formed in silty material and till on glacial till plains. They are not so clayey throughout as the Milford soils. Montgomery soils are stratified. They are underlain by gravel. Their solum contains more clay and less sand than that of the Milford soils.

Typical pedon of Milford silty clay, in a cultivated field, 710 feet west and 1,040 feet north of the southeast corner of sec. 9, T. 9 N., R. 8 E.

Ap—0 to 10 inches; black (2.5Y 2/1) silty clay, gray (5Y 5/1) dry; few fine distinct dark grayish brown (2.5Y 4/2) mottles; moderate fine subangular blocky structure; firm; common fine distinct dark brown (7.5YR 4/4) iron and manganese oxide accumulations; neutral; abrupt smooth boundary.

A12—10 to 14 inches; very dark gray (10YR 3/1) silty clay loam, gray (5Y 5/1) dry; common fine distinct dark grayish brown (2.5Y 4/2) mottles; moderate fine subangular blocky structure; firm; neutral; clear wavy boundary.

B21g—14 to 20 inches; very dark gray (N 3/0) silty clay loam, gray (5Y 5/1) dry; common fine distinct olive brown (2.5Y 4/4) mottles; moderate fine prismatic structure parting to strong fine angular blocky; firm; thin discontinuous dark gray (N 4/0) organic films on faces of peds; neutral; clear wavy boundary.

B22g—20 to 31 inches; gray (5Y 5/1) silty clay; common fine distinct pale olive (5Y 6/3) and common fine distinct olive (5Y 5/6) mottles; moderate medium prismatic structure parting to strong medium angular blocky; firm; thin discontinuous dark gray (5Y 4/1) organic films on faces of peds; neutral; clear wavy boundary.

B23g—31 to 47 inches; gray (5Y 6/1) silty clay loam; common fine distinct pale olive (5Y 6/3) mottles; weak medium prismatic structure parting to strong medium angular blocky; firm; thin discontinuous dark gray (N 4/0) organic films on faces of peds; slight effervescence; neutral; clear wavy boundary.

C—47 to 60 inches; gray (5Y 5/1) stratified silty clay loam, silty clay, and silt loam; common fine distinct yellowish brown (10YR 5/6) mottles; massive; firm; slight effervescence; mildly alkaline.

The solum is 40 to 60 inches thick. The mollic epipedon is 12 to 20 inches thick.

The A horizon has hue of 10YR or 2.5Y, value of 2 or 3, and chroma of 1 or is neutral in hue and has value of 2 or 3. It is silty clay loam or silty clay. The B21g horizon has hue of 2.5Y or 5Y, value of 3, and chroma of 1 or is very dark gray (N 3/0). The B22g and B23g horizons have hue of 5Y, 2.5Y, or 10YR, value of 4 to 6, and chroma of 1 or 2. The average content of clay in these horizons is 35 to 42 percent, and the average content of sand is less than 10 percent. The B22g horizon is neutral, and the B23g horizon is neutral or mildly alkaline. The C horizon has hue of 5Y, 2.5Y, or 10YR, value of 5 or 6, and chroma of 0 to 6. It is silty clay loam, silty clay, clay loam, silt loam, or loam. It is mildly alkaline or moderately alkaline.

Millsdale series

The Millsdale series consists of moderately deep, very poorly drained, moderately slowly permeable soils on broad flats and in drainageways on till plains. These soils formed in loamy glacial till and residuum of limestone bedrock. Slopes are 0 to 1 percent.

Millsdale soils are similar to Milford soils and are commonly adjacent to Crosby, Fincastle, and Milton soils. Fincastle and Milford soils do not have bedrock within a depth of 40 inches. The subsoil of Milford soils contains less sand than that of the Millsdale soils. Crosby, Fincastle, and Milton soils are higher on the landscape than the Millsdale soils. Also, their surface layer and subsoil are browner.

Typical pedon of Millsdale silty clay loam, in a cultivated field, 380 feet west and 400 feet south of the northeast corner of sec. 10, T. 10 N., R. 8 E.

Ap—0 to 9 inches; very dark gray (10YR 3/1) silty clay loam, gray (10YR 5/1) dry; moderate medium granular structure; firm; about 1 percent gravel; slightly acid; abrupt smooth boundary.

B21tg—9 to 14 inches; very dark gray (5Y 3/1) clay loam, gray (5Y 5/1) dry; common fine distinct dark grayish brown (2.5Y 4/3) and brown (7.5YR 5/4) mottles; weak medium prismatic structure parting to moderate medium angular and subangular blocky; firm; thin continuous olive gray (5Y 4/2) clay films on faces of peds; neutral; clear wavy boundary.

B22tg—14 to 19 inches; very dark gray (5Y 3/1) clay loam, gray (5Y 6/1) dry; common fine faint dark gray (5Y 4/1) mottles; moderate medium subangular blocky structure; firm; thin discontinuous very dark gray (N 3/0) clay films on faces of peds; neutral; clear wavy boundary.

B23tg—19 to 30 inches; gray (5Y 5/1) clay loam; many fine distinct olive gray (5Y 4/2) mottles; moderate medium subangular blocky structure; firm; thin discontinuous olive gray (5Y 4/2) clay films on faces of peds; about 2 percent gravel; neutral; gradual wavy boundary.

B24tg—30 to 33 inches; yellowish brown (10YR 5/4) clay loam; many fine distinct olive gray (5Y 4/2) and dark gray (5Y 4/1) mottles; moderate coarse subangular blocky structure; firm; thin discontinuous dark gray (5Y 4/1) clay films on faces of peds; neutral; clear wavy boundary.

IIB25—33 to 36 inches; yellowish brown (10YR 5/4) clay loam; many fine prominent dark gray (5Y 4/1) mottles; moderate medium subangular blocky structure; firm; neutral; clear wavy boundary.

IIR—36 inches; light gray (10YR 7/2) hard limestone bedrock.

The thickness of the solum is 20 to 40 inches and is the same as the depth to limestone bedrock. The mollic epipedon is 10 to 15 inches thick.

The Ap horizon is very dark gray (N 3/0 or 10YR 3/1) or very dark grayish brown (10YR 3/2 or 2.5Y 3/2). It is silty clay loam or clay loam. It is neutral or slightly acid. The B2tg horizon is clay, silty clay loam, or clay loam. It averages more than 35 percent clay. The B21tg and B22tg horizons have hue of 5Y, 2.5Y, or 10YR, value of 3, and chroma of 1 or 2. The B23tg and B24tg horizons have hue of 5Y, 2.5Y, or 10YR, value of 4 or 5, and chroma of 1 to 4 or are neutral in hue and have value of 4 or 5. The IIB2 horizon, which formed in residuum, is slightly acid to moderately alkaline.

Milton series

The Milton series consists of moderately deep, well drained, moderately slowly permeable soils on swells and rises on glacial till plains. These soils formed in loess and in the underlying glacial till and residuum of limestone bedrock. Slopes range from 0 to 6 percent.

Milton soils are commonly adjacent to Corydon, Crosby, Fincastle, Russell, and Xenia soils. Corydon soils do not have an argillic subsoil. They have bedrock within a depth of 20 inches. They are steeper than the Milton soils. Also, they are less clayey. Crosby, Fincastle, Russell, and Xenia soils do not have bedrock within a depth of 60 inches. Crosby and Fincastle soils are lower on the landscape than the Milton soils. Also, they are grayer in the subsoil and are mottled. Russell and Xenia soils have a loess mantle that is 22 to 36 inches thick. Xenia soils are mottled in the lower part of the subsoil. They are on the lower lying parts of the landscape.

Typical pedon of Milton silt loam, 2 to 6 percent slopes, eroded, in a cultivated field, 400 feet south and 1,900 feet west of the northeast corner of sec. 5, T. 10 N., R. 8 E.

Ap—0 to 11 inches; dark brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; weak fine platy structure parting to weak fine granular; friable; many specks of yellowish brown (10YR 5/4) subsoil material; neutral; abrupt smooth boundary.

B21t—11 to 16 inches; yellowish brown (10YR 5/4) silt loam; moderate medium subangular blocky structure; firm; thin continuous dark brown (10YR 3/3) clay films on faces of peds; few fine very dark gray (10YR 3/1) iron and manganese oxide accumulations; neutral; clear wavy boundary.

IIB22t—16 to 24 inches; dark yellowish brown (10YR 4/4) clay loam; moderate coarse subangular blocky structure; firm; thin continuous dark brown (10YR 4/3) clay films on faces of peds and lining pores; few fine very dark gray (10YR 3/1) iron and manganese oxide accumulations; neutral; clear wavy boundary.

IIIB23t—24 to 33 inches; dark brown (10YR 4/3) clay; strong medium subangular blocky structure; firm; thin continuous dark brown (10YR 3/3) clay films on faces of peds; few fine very dark gray (10YR 3/1) iron and manganese oxide accumulations; neutral; abrupt smooth boundary.

IIIC—33 to 34 inches; light gray (2.5Y 7/2) silty clay loam; massive; firm; about 3 percent gravel; neutral; abrupt smooth boundary.

IIIR—34 inches; very pale brown (10YR 7/3) hard limestone bedrock.

The solum is 20 to 40 inches thick. The loess is 10 to 16 inches thick. The depth to bedrock is 20 to 40 inches.

The Ap horizon is dark brown (10YR 4/3) or brown (10YR 5/3). It is neutral or slightly acid. The A2 horizon, if it occurs, is brown (10YR 5/3) silt loam. The B2t horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 or 4. It is silty clay loam or silt loam. It is neutral to medium acid. The IIB2t horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 or 4. It is clay loam, silty clay loam, or clay. It is neutral to medium acid. The IIIB2 horizon has hue of 10YR and value and chroma of 3 or 4. It is silty clay, silty clay loam, or clay. It is neutral or slightly acid. The IIIC horizon has hue of 10YR or 2.5Y, value of 5 to 7, and chroma of 2 to 4. It is silt loam, silty clay loam, or clay.

Montgomery series

The Montgomery series consists of deep, very poorly drained soils that are slowly permeable in the subsoil and moderately rapidly permeable or rapidly permeable in the substratum. These soils are on outwash terraces. They formed in stratified lacustrine sediments over gravelly, loamy and sandy outwash. Slopes range from 0 to 2 percent.

Montgomery soils are similar to Cyclone and Milford soils and are commonly adjacent to Fox, Martinsville, and Ockley soils. Cyclone soils formed in loess and till. They are less clayey than the Montgomery soils. Milford soils are underlain by lacustrine sediments and till. Their solum is less clayey than that of the Montgomery soils. Fox, Martinsville, and Ockley soils have an argillic horizon. They are well drained and are on the higher lying parts of the landscape. They are redder than the Montgomery soils.

Typical pedon of Montgomery silty clay, gravelly substratum, in a cultivated field, 630 feet west and 1,530 feet south of the center of sec. 14, T. 11 N., R. 8 E.

Ap—0 to 7 inches; very dark gray (5Y 3/1) silty clay, gray (5Y 5/1) dry; common fine faint dark grayish brown (2.5Y 4/2) mottles; moderate fine granular structure; firm; neutral; abrupt wavy boundary.

A12—7 to 14 inches; very dark gray (N 3/0) silty clay, gray (N 5/0) dry; common fine faint dark grayish brown (2.5Y 4/2) mottles; moderate coarse angular blocky structure; firm; many fine prominent dark brown (7.5YR 4/4) iron and manganese oxide accumulations; neutral; clear wavy boundary.

B21g—14 to 18 inches; dark gray (5Y 4/1) silty clay; weak fine prismatic structure parting to moderate coarse angular blocky; firm; thin discontinuous very dark gray (5Y 3/1) clay films on faces of peds; many fine prominent dark brown (7.5YR 4/4) iron and manganese oxide accumulations; neutral; clear wavy boundary.

B22g—18 to 33 inches; gray (5Y 5/1) silty clay; weak medium prismatic structure parting to strong medium angular blocky; firm; thin discontinuous very dark gray (5Y 3/1) clay films on faces of peds; common fine dark brown (7.5YR 4/4) iron and manganese oxide accumulations; neutral; clear wavy boundary.

B23g—33 to 38 inches; gray (5Y 5/1) silty clay loam; moderate medium angular blocky structure; firm; thin discontinuous very dark gray (5Y 3/1) clay films on faces of peds; few fine prominent dark brown (7.5YR 4/4) iron and manganese oxide accumulations; neutral; clear wavy boundary.

IIC1—38 to 43 inches; dark gray (5Y 4/1) silt loam; massive; firm; about 5 percent gravel; mildly alkaline; clear wavy boundary.

IIC2—43 to 60 inches; gray (5Y 5/1) very gravelly loam; common fine distinct olive (5Y 5/3) mottles; massive; firm; about 25 percent gravel; strong effervescence; mildly alkaline.

The solum is 35 to 60 inches thick. The mollic epipedon is 10 to 15 inches thick.

The A horizon has hue of 5Y to 10YR, value of 3, and chroma of 1 or 2 or is neutral in hue and has value of 3. It is silty clay or silty clay loam. The B2g horizon has hue of 5Y to 10YR, value of 4 to 6, and chroma of 2 or less. It is silty clay or silty clay loam. The IIC horizon has hue of 10YR to 5Y, value of 4 to 7, and chroma of 0 to 8. It

is silt loam and the gravelly or very gravelly analogs of loam, sandy loam, or silt loam. It is mildly alkaline or moderately alkaline.

Ockley series

The Ockley series consists of deep, well drained soils that are moderately permeable in the upper part and very rapidly permeable in the substratum. These soils are on outwash terraces and kames. They formed in loamy outwash over gravel and sand. Slopes range from 0 to 6 percent.

Ockley soils are similar to Fox, Martinsville, Montgomery, and Rodman soils and are commonly adjacent to those soils. The solum of Fox and Rodman soils is thinner than that of the Ockley soils. Rodman soils have a mollic epipedon. They are less clayey than the Ockley soils and are steeper. Martinsville soils contain less gravel in the lower part of the subsoil and the substratum than the Ockley soils. Montgomery soils are very poorly drained and are in depressions. They have a mollic epipedon. Their solum is more clayey than that of the Ockley soils.

Typical pedon of Ockley silt loam, 0 to 2 percent slopes, in a cultivated field, 200 feet east and 560 feet south of the northwest corner of sec. 11, T. 11 N., R. 9 E.

Ap—0 to 7 inches; brown (10YR 4/3) silt loam, light brownish gray (10YR 6/2) dry; moderate fine granular structure; friable; medium acid; abrupt smooth boundary.

B1t—7 to 14 inches; yellowish brown (10YR 5/6) silt loam; moderate medium subangular blocky structure; firm; slightly acid; clear wavy boundary.

IIB21t—14 to 26 inches; dark yellowish brown (10YR 4/6) loam; strong medium subangular blocky structure; firm; thin continuous dark yellowish brown (10YR 3/4) clay films on faces of peds and pebbles; medium acid; clear wavy boundary.

IIB22t—26 to 37 inches; dark yellowish brown (10YR 4/6) gravelly sandy clay loam; moderate coarse subangular blocky structure; firm; thin continuous dark yellowish brown (10YR 4/4) clay films on faces of peds and pebbles; about 17 percent gravel; medium acid; clear wavy boundary.

IIB3—37 to 45 inches; dark reddish brown (5YR 3/4) gravelly sandy loam; weak coarse subangular blocky structure; friable; about 20 percent gravel; medium acid; abrupt irregular boundary.

IIC—45 to 60 inches; yellowish brown (10YR 5/4) very gravelly coarse sand that has thin lenses of coarse sand; single grain; loose; about 50 percent gravel; strong effervescence; moderately alkaline.

The solum is 40 to 60 inches thick. The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 3 to 5. It is loam or silt loam. It is medium acid to neutral. The B1t and B2t horizons have hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 3 to 6. The upper part of the B2 horizon is silt loam, silty clay loam, clay loam, or loam and is neutral to strongly acid. The lower part is clay loam, gravelly loam, gravelly sandy clay loam, or gravelly clay loam and is medium acid or slightly acid. In some pedons the IIB3 horizon has value of 3 or 4 and chroma of 2 or 3. The C horizon is commonly stratified. It is very gravelly or gravelly loamy sand, very gravelly or gravelly coarse sand, or coarse sand.

Orrville series

The Orrville series consists of deep, somewhat poorly drained, moderately permeable soils on flood plains. These soils formed in recent alluvium. Slopes range from 0 to 2 percent.

Orrville soils are commonly adjacent to Chagrin, Lobdell, and Sloan soils. Chagrin and Lobdell soils are higher on the landscape than the Orrville soils. Also, they are browner below the surface layer. Sloan soils have a mollic epipedon. They are on bottom land.

Typical pedon of Orrville silt loam, frequently flooded, in a cultivated field, 200 feet west and 1,500 feet south of the northeast corner of sec. 30, T. 9 N., R. 8 E.

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) silt loam, pale brown (10YR 6/3) dry; weak medium granular structure; friable; neutral; abrupt smooth boundary.

A12—7 to 10 inches; dark grayish brown (10YR 4/2) silt loam, pale brown (10YR 6/3) dry; weak thin platy structure; firm; neutral; clear wavy boundary.

B21—10 to 14 inches; brown (10YR 5/3) silt loam; common medium distinct gray (10YR 6/1) mottles; moderate fine subangular blocky structure; firm; thin continuous grayish brown (10YR 5/2) organic coatings on faces of peds; few fine yellowish brown (10YR 5/6) iron oxide accumulations; slightly acid; clear smooth boundary.

B22—14 to 19 inches; yellowish brown (10YR 5/4) silt loam; many medium distinct light brownish gray (10YR 6/2) mottles; weak medium subangular blocky structure; firm; thin continuous grayish brown (10YR 5/2) organic coatings on faces of peds; few medium yellowish brown (10YR 5/8) iron oxide accumulations; medium acid; clear wavy boundary.

B23—19 to 30 inches; light brownish gray (10YR 6/2) silt loam; many medium distinct yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; firm; thin continuous grayish brown (10YR 5/2) organic coatings on faces of peds; medium acid; clear wavy boundary.

B24—30 to 40 inches; light brownish gray (10YR 6/2) silt loam; common fine distinct grayish brown (10YR 5/2) and many medium distinct yellowish brown (10YR 5/6) mottles; weak coarse subangular blocky structure; firm; thin discontinuous grayish brown (10YR 5/2) organic coatings on faces of peds; neutral; clear smooth boundary.

C—40 to 60 inches; yellowish brown (10YR 5/4) loam; common fine distinct grayish brown (10YR 5/2) and few fine distinct yellowish brown (10YR 5/6) mottles; massive; firm; common medium black (10YR 2/1) manganese oxide accumulations; neutral.

The solum is 30 to 50 inches thick. The B2 horizon has hue of 10YR, value of 4 to 6, and chroma of 2 to 4 and is distinctly mottled. It is silt loam, loam, or fine sandy loam. It is medium acid to neutral. The C horizon has hue of 10YR, value of 4 or 5, and chroma of 1 to 4 and is mottled. It has textures similar to those of the B horizon. It is neutral to moderately alkaline.

Rodman series

The Rodman series consists of excessively drained, very rapidly permeable soils on outwash terraces. These soils are shallow to very gravelly coarse sand. They formed in loamy outwash over sand and gravel. Slopes range from 35 to 60 percent.

Rodman soils are similar to Fox, Hennepin, and Ockley soils and are commonly adjacent to Fox and Ockley soils. The adjacent soils have an argillic horizon. They are less sloping than the Rodman soils. Also, their solum is thicker. Hennepin soils formed in till. They are not so sandy or gravelly as the Rodman soils. They are in positions on the landscape similar to those of the Rodman soils.

Typical pedon of Rodman gravelly sandy loam, 35 to 60 percent slopes, in a wooded area, 2,160 feet east and 280 feet north of the southwest corner of sec. 6, T. 10 N., R. 8 E.

A1—0 to 8 inches; very dark grayish brown (10YR 3/2) gravelly sandy loam, grayish brown (10YR 5/2) dry; weak fine granular structure; very friable; neutral; about 20 percent gravel; clear smooth boundary.

B2—8 to 13 inches; dark brown (10YR 4/3) very gravelly sandy loam, pale brown (10YR 6/3) dry; weak fine granular structure; very friable; about 50 percent gravel; strong effervescence; mildly alkaline; clear wavy boundary.

C—13 to 60 inches; dark brown (10YR 4/3) very gravelly coarse sand; single grain; loose; about 65 percent gravel; strong effervescence; mildly alkaline.

The solum is 10 to 15 inches thick. The A horizon is very dark grayish brown (10YR 3/2) or very dark brown (10YR 2/2) sandy loam, gravelly sandy loam, very gravelly sandy loam, or gravelly loam. It is neutral to moderately alkaline. The B2 horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 or 4. It is sandy loam, loam, gravelly sandy loam, very gravelly sandy loam, or gravelly loam. It is neutral or mildly alkaline. The C horizon has hue of 10YR, value of 3 to 6, and chroma of 2 to 6. It is gravelly loamy sand, gravelly sandy loam, or very gravelly coarse sand. It is mildly alkaline or moderately alkaline.

Rossmoyne series

The Rossmoyne series consists of deep, moderately well drained, slowly permeable soils on upland shoulder slopes, back slopes, and side slopes. These soils have a fragipan. They formed in loess and in the underlying silty glacial drift and glacial till. Slopes range from 2 to 6 percent.

The Rossmoyne soils in this county have a lower base saturation in the horizons below the fragipan than is defined as the range for the series. This difference, however, does not alter the use or behavior of the soils.

Rossmoyne soils are commonly adjacent to Avonburg and Cincinnati soils. Avonburg soils are on the lower lying parts of the landscape. The upper part of their subsoil is grayer than that of the Rossmoyne soils. Cincinnati soils are well drained. They generally are on swells or side slopes.

Typical pedon of Rossmoyne silt loam, 2 to 6 percent slopes, eroded, in a cultivated field, 2,250 feet west and 440 feet north of the southeast corner of sec. 7, T. 8 N., R. 9 E.

Ap—0 to 7 inches; brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; moderate medium granular structure; friable; medium acid; abrupt smooth boundary.

B1—7 to 10 inches; yellowish brown (10YR 5/4) silt loam; weak fine subangular blocky structure; firm; very strongly acid; clear wavy boundary.

B21t—10 to 13 inches; yellowish brown (10YR 5/4) silt loam; moderate fine subangular blocky structure; firm; thin discontinuous dark yellowish brown (10YR 4/4) clay films on faces of peds; very strongly acid; clear wavy boundary.

B22t—13 to 21 inches; yellowish brown (10YR 5/6) silt loam; common fine distinct grayish brown (10YR 5/2) mottles; moderate medium subangular blocky structure; firm; thin discontinuous yellowish brown (10YR 5/4) clay films on faces of peds; strongly acid; clear smooth boundary.

IIBx1—21 to 57 inches; yellowish brown (10YR 5/6) silt loam; few fine distinct grayish brown (10YR 5/2) mottles; moderate very coarse prismatic structure; very firm; brittle; common fine flattened roots along walls of prisms; very fine and fine pores; thin continuous dark brown (10YR 4/3) and gray (10YR 5/1) clay films on faces of peds and lining the walls of pores; thick continuous light gray (10YR 7/2) silt films on faces and tops of prisms; strongly acid; gradual wavy boundary.

IIBx2—57 to 72 inches; yellowish brown (10YR 5/6) silt loam; common fine distinct light brownish gray (10YR 6/2) and common fine distinct light yellowish brown (10YR 6/4) mottles; moderate very coarse prismatic structure; very firm; brittle; common fine flattened roots along walls of prisms; many very fine and fine pores; thin continuous dark brown (10YR 4/3) and gray (10YR 5/1) clay films on faces of peds and lining the walls of pores; thin and medium continuous light gray (10YR 7/2) silt films on faces and tops of prisms; medium acid; gradual wavy boundary.

IIIB3t—72 to 80 inches; yellowish brown (10YR 5/6) loam; moderate coarse subangular blocky structure; firm; medium continuous gray (10YR 5/1) clay films on faces of peds; neutral.

The solum is 70 to 100 inches thick. The loess is 18 to 35 inches thick. The depth to the fragipan ranges from 20 to 30 inches.

The Ap horizon is brown (10YR 4/3 or 5/3) or dark grayish brown (10YR 4/2). It is medium acid to neutral. The A2 horizon, if it occurs, is brown (10YR 5/3) silt loam that has moderate thin platy structure.

The B21t horizon has hue of 10YR, value of 5, and chroma of 4 to 6. It is silt loam or silty clay loam. It is very strongly acid or strongly acid. The B22t horizon has colors similar to those of the B21t horizon. It has few or common mottles with chroma of 2. It is strongly acid or very strongly acid. The IIBx horizon has hue of 10YR, value of 4 or 5, and chroma of 4 to 6 and has mottles with chroma of 2. It is silt loam in the upper part and silt loam, loam, or clay loam in the lower part. It is very strongly acid or strongly acid in the upper part and medium acid or slightly acid in the lower part. The IIIB3t horizon has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 4 to 8. It is loam or clay loam. It is neutral or slightly acid.

Russell series

The Russell series consists of deep, well drained, moderately permeable soils on loess covered glacial till plains. These soils formed in silty loess and the underlying loamy glacial till. Slopes range from 1 to 5 percent.

Russell soils are similar to Hickory and Miami soils and are commonly adjacent to Xenia soils. Hickory and Miami soils have a loess mantle that is less than 20 inches thick. Miami soils are on the higher lying parts of the landscape. Their solum is thinner than that of the Russell soils. Hickory soils are steeper than the Russell soils. Also, their solum is somewhat thicker. Xenia soils have gray mottles. They are on the lower lying parts of the landscape.

Typical pedon of Russell silt loam, 1 to 5 percent slopes, in a cultivated field, 1,100 feet east and 800 feet south of the northwest corner of sec. 4, T. 10 N., R. 8 E.

Ap—0 to 8 inches; brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; moderate medium granular structure; friable; neutral; abrupt smooth boundary.

B1—8 to 12 inches; brown (10YR 4/3) silt loam; moderate medium subangular blocky structure; firm; strongly acid; clear wavy boundary.

B21t—12 to 19 inches; dark yellowish brown (10YR 4/4) silty clay loam; strong medium subangular blocky structure; firm; thin discontinuous dark brown (10YR 4/3) clay films on faces of peds; strongly acid; clear wavy boundary.

B22t—19 to 30 inches; yellowish brown (10YR 5/4) silty clay loam; moderate medium subangular blocky structure; firm; thin continuous dark yellowish brown (10YR 4/4) clay films on faces of peds; medium acid; clear wavy boundary.

IIB23t—30 to 42 inches; dark yellowish brown (10YR 4/4) loam; moderate medium subangular blocky structure; firm; thin continuous dark brown (10YR 4/3) clay films on faces of peds; few coarse yellowish red (5YR 4/6) iron oxide accumulations; about 2 percent fine gravel; neutral; gradual wavy boundary.

IIB3—42 to 50 inches; yellowish brown (10YR 5/4) loam; moderate coarse subangular blocky structure; firm; few medium yellowish red (5YR 4/6) iron oxide accumulations; about 2 percent gravel; strong effervescence; mildly alkaline; gradual wavy boundary.

IIC—50 to 60 inches; yellowish brown (10YR 5/4) loam; massive; firm; about 3 percent gravel; strong effervescence; moderately alkaline.

The solum is 40 to 56 inches thick. The loess is 22 to 36 inches thick.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 3. It is medium acid to neutral. The A2 horizon, if it occurs, has hue of 10YR, value of 5, and chroma of 3 or 4. The B2t and IIB2t horizons have hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6. The B2t horizon is silty clay loam or silt loam. It is strongly acid to slightly acid. The IIB2t horizon is clay loam or loam. It is medium acid to neutral. The IIC horizon has hue of 10YR, value of 5 or 6, and chroma of

3 or 4. It is fine sandy loam or loam. It is mildly alkaline or moderately alkaline.

Ryker series

The Ryker series consists of deep, well drained, moderately permeable soils on upland side slopes. These soils formed in loess and in the underlying glacial till and residuum of hard limestone. Slopes range from 4 to 10 percent.

The Ryker soils in this county have lower base saturation and less clay in the lower part of the argillic horizon than is defined as the range for the series. These differences, however, do not alter the use or behavior of the soils.

Ryker soils are similar to Grayford and Hickory soils and are commonly adjacent to Cincinnati, Corydon, and Rossmoyne soils. Grayford and Hickory soils contain more sand in the upper part of the subsoil than the Ryker soils. Also, their solum and loess mantle are thinner. Hickory, Cincinnati, and Rossmonye soils have a fragipan. Cincinnati and Rossmoyne soils do not have residuum of limestone in the lower part of the solum. Corydon soils have bedrock at a depth of 20 to 40 inches. Their solum is thinner than that of the Ryker soils.

Typical pedon of Ryker silt loam, in an area of Grayford-Ryker silt loams, 4 to 10 percent slopes, eroded, in a cultivated field, 2,010 feet east and 2,150 feet south of the northwest corner of sec. 5, T. 8 N., R. 9 E.

Ap—0 to 7 inches; brown (10YR 4/3) silt loam, light brownish gray (10YR 6/2) dry; moderate medium granular structure; friable; about 5 percent dark yellowish brown (10YR 4/4) subsoil material; slightly acid; abrupt smooth boundary.

B21t—7 to 24 inches; yellowish brown (10YR 5/6) silt loam; about 27 percent clay; moderate medium subangular blocky structure; firm; thin continuous dark brown (7.5YR 4/4) clay films on faces of peds; strongly acid; gradual wavy boundary.

IIB22t—24 to 30 inches; strong brown (7.5YR 5/6) silt loam; about 23 percent fine sand; moderate medium subangular blocky structure; firm; thin continuous dark yellowish brown (10YR 4/4) clay films on faces of peds; very strongly acid; gradual wavy boundary.

IIIB23t—30 to 59 inches; red (2.5YR 4/6) clay loam; strong coarse subangular blocky structure; firm; thin continuous reddish brown (2.5YR 4/4) clay films on faces of peds; thin discontinuous pale brown (10YR 6/3) sand coatings on faces of peds; very strongly acid; gradual wavy boundary.

IIIB3—59 to 80 inches; red (2.5YR 5/8) clay loam; common medium distinct brownish yellow (10YR 6/8) mottles; moderate coarse subangular blocky structure; firm; few chert fragments; very strongly acid; abrupt wavy boundary.

IIIR—80 inches; light gray (10YR 7/2) hard cherty limestone bedrock.

The solum is 60 to 96 inches thick. The loess is 24 to 40 inches thick. The bedrock is at a depth of 60 to 120 inches.

The Ap horizon is brown (10YR 4/3) or yellowish brown (10YR 5/4). It is strongly acid to neutral, depending on past liming practices. The B2t horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 6. It is silt loam or silty clay loam. It is strongly acid or very strongly acid. The IIB2t horizon has hue of 5YR or 7.5YR, value of 4 or 5, and chroma of 6. It is clay loam, loam, silt loam, or silty clay loam. It is strongly acid or very strongly acid. The IIIB2t horizon has hue of 2.5YR or 5YR, value of 4 or 5, and chroma of 6 to 8. It is clay loam, loam, clay, or silty clay. It is very strongly acid to medium acid. The IIIB3 horizon is similar to the IIIB2t horizon but is cherty in some pedons.

Sloan series

The Sloan series consists of deep, very poorly drained, moderately permeable soils on flood plains. These soils formed in recent alluvium. Slopes range from 0 to 2 percent.

Sloan soils are similar to Milford, Millsdale, and Montgomery soils and are commonly adjacent to Orrville soils. The similar soils are more clayey than the Sloan soils. Also, Millsdale soils have an argillic subsoil and have bedrock within a depth of 40 inches. Orrville soils do not have a mollic epipedon. They are on the higher lying parts of the landscape. Their subsoil is browner than that of the Sloan soils.

Typical pedon of Sloan silt loam, frequently flooded, in a cultivated field, 220 feet west and 620 feet south of the center of sec. 6, T. 11 N., R. 9 E.

Ap—0 to 8 inches; very dark gray (10YR 3/1) silt loam, gray (10YR 5/1) dry; moderate fine subangular blocky structure; friable; about 5 percent fine gravel; neutral; abrupt wavy boundary.

A12—8 to 13 inches; very dark gray (10YR 3/1) silt loam, gray (10YR 5/1) dry; many fine distinct dark yellowish brown (10YR 4/4) mottles; weak medium subangular blocky structure; firm; about 2 percent gravel; neutral; clear wavy boundary.

B21g—13 to 21 inches; dark gray (10YR 4/1) loam; many medium distinct dark yellowish brown (10YR 4/4) mottles; moderate medium subangular blocky structure; firm; about 2 percent fine gravel; neutral; gradual wavy boundary.

B22g—21 to 28 inches; dark gray (10YR 4/1) loam; common medium distinct dark yellowish brown (10YR 4/4) mottles; moderate coarse subangular blocky structure; firm; about 3 percent fine gravel; neutral; gradual wavy boundary.

B3g—28 to 44 inches; dark gray (10YR 4/1) loam; many fine distinct brown (10YR 4/3) mottles; moderate coarse subangular blocky structure; firm; about 3 percent fine gravel; neutral; clear wavy boundary.

Cg—44 to 60 inches; gray (N 5/0) loam; few coarse distinct dark grayish brown (10YR 4/2) mottles; massive; firm; about 4 percent gravel; slight effervescence; mildly alkaline.

The solum is 20 to 50 inches thick. The mollic epipedon is 10 to 20 inches thick.

The Ap horizon has hue of 10YR or 2.5Y, value of 3, and chroma of 1 or 2. It is silt loam, loam, or silty clay loam. It is slightly acid to mildly alkaline. The B horizon is neutral in hue or has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 1 or 2. It is loam, silt loam, silty clay loam, or clay loam. It is slightly acid to mildly alkaline. The C horizon is neutral in hue or has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 1 to 6. It is silty clay loam, clay loam, silt loam, or loam. It is neutral to moderately alkaline.

Starks series

The Starks series consists of deep, somewhat poorly drained, moderately permeable soils on loess covered outwash terraces. These soils formed in loess and the underlying loamy outwash. Slopes range from 0 to 2 percent.

Starks soils are similar to Crosby and Fincastle soils and are commonly adjacent to Cyclone, Ockley, Williamstown, and Xenia soils. In all of those soils except for Ockley soils, the lower part of the solum formed in till. The solum and the loess mantle of Crosby and Williamstown soils are thinner than those of the Starks soils. Cyclone soils have a mollic epipedon. They are in depressions. Ockley, Williamstown, and Xenia soils are browner directly below the surface layer than the Starks soils. Ockley soils are on the higher swells. Williamstown and Xenia soils are on swells.

Typical pedon of Starks silt loam, in a cultivated field, 1,300 feet east and 150 feet north of the center of sec. 14, T. 11 N., R. 8 E.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; weak fine granular structure; friable; neutral; abrupt smooth boundary.

A2—8 to 13 inches; gray (10YR 5/1) silt loam; common fine distinct yellowish brown (10YR 5/6) and pale brown (10YR 6/3) mottles; weak medium platy structure parting to weak fine granular; friable; neutral; clear wavy boundary.

B21tg—13 to 25 inches; grayish brown (10YR 5/2) silty clay loam; many fine distinct yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; firm; thin discontinuous dark yellowish brown (10YR 4/4) clay films and thin continuous gray (10YR 6/1) silt films on faces of peds and lining pores; slightly acid; clear wavy boundary.

IIB22t—25 to 50 inches; yellowish brown (10YR 5/4) loam; many fine distinct light brownish gray (10YR 6/2) and olive yellow (2.5Y 6/6) mottles; strong medium and coarse subangular blocky structure; firm; thin continuous dark yellowish brown (10YR 4/4) clay films and thin continuous gray (10YR 6/1) silt films on faces of peds and lining pores; slightly acid; clear wavy boundary.

IIB3t—50 to 56 inches; yellowish brown (10YR 5/4) silt loam; many fine distinct light brownish gray (10YR 6/2) and light yellowish brown (2.5Y 6/4) mottles; moderate coarse subangular blocky structure; firm; thin discontinuous dark grayish brown (10YR 4/2) clay films on faces of peds; slightly acid; clear wavy boundary.

IIC1—56 to 62 inches; dark yellowish brown (10YR 4/6) silt loam; many fine distinct yellowish brown (10YR 5/6) and common fine distinct light brownish gray (10YR 6/2) mottles; friable; massive; neutral; abrupt wavy boundary.

IIC2g—62 to 80 inches; grayish brown (10YR 5/2) sandy loam and strata of light yellowish brown (10YR 6/4), brown (10YR 5/3), and light brownish gray (10YR 6/2) silt loam, each about 3 inches thick; many fine faint brown (10YR 5/3) mottles; massive; very friable; strong effervescence; moderately alkaline.

The solum is 48 to 60 inches thick. The loess is 20 to 34 inches thick.

The Ap horizon is dark grayish brown (10YR 4/2), grayish brown (10YR 5/2), or brown (10YR 4/3). It is neutral to medium acid. The A2 horizon, if it occurs, is gray (10YR 5/1), light brownish gray (10YR 6/2), or grayish brown (10YR 5/2). The B2t horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 4 and is distinctly mottled. It is silty clay loam or silt loam. It is slightly acid or neutral. The IIBt horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2 to 4 and is distinctly mottled. It is silty clay loam, silt loam, clay loam, loam, or sandy loam. It is slightly acid or neutral. The C horizon has hue of 10YR, value of 4 to 6, and chroma of 2 to 6. It is stratified silt loam, sandy loam, or sand. It is neutral to moderately alkaline.

Stonelick series

The Stonelick series consists of deep, well drained, moderately rapidly permeable soils on flood plains. These soils formed in recent alluvium. Slopes range from 0 to 2 percent.

Stonelick soils are similar to Chagrin soils and are commonly adjacent to Lobdell soils. Chagrin and Lobdell soils contain more clay and less sand to a depth of 40 inches than the Stonelick soils. Lobdell soils are on the lower parts of the landscape. They are grayer than the Stonelick soils.

Typical pedon of Stonelick fine sandy loam, frequently flooded, in a cultivated field, 2,400 feet east and 460 feet south of the northwest corner of sec. 7, T. 11 N., R. 9 E.

Ap—0 to 8 inches; dark brown (10YR 3/3) fine sandy loam, light brownish gray (10YR 6/2) dry; weak fine granular structure; very friable; mildly alkaline; abrupt smooth boundary.

C1—8 to 15 inches; dark brown (10YR 4/3) fine sandy loam, light brownish gray (10YR 6/2) dry; weak fine granular structure; very friable; strong effervescence; moderately alkaline; clear wavy boundary.

C2—15 to 40 inches; dark brown (10YR 4/3) fine sandy loam; massive; very friable; strong effervescence; moderately alkaline; abrupt wavy boundary.

C3—40 to 60 inches; brown (10YR 4/3) stratified loamy sand and sand; single grain; very friable; about 2 percent gravel; strong effervescence; moderately alkaline.

The Ap horizon has hue of 10YR, value of 3 to 5, and chroma of 3 or 4. It is fine sandy loam, loam, or sandy loam. The content of gravel in this horizon ranges from 0 to 15 percent. The C horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. It is neutral to moderately alkaline. It is stratified fine sandy loam, loam, loamy sand, sand, or sandy loam. The content of gravel in this horizon ranges from 0 to 15 percent.

Williamstown series

The Williamstown series consists of deep, moderately well drained soils that are moderately permeable in the upper part and moderately slowly permeable in the substratum. These soils are on loess covered glacial till plains. They formed in loess and the underlying glacial till. Slopes range from 1 to 5 percent.

Williamstown soils are similar to Xenia soils and are commonly adjacent to Crosby, Cyclone, Fincastle, and Miami soils. Xenia soils are in positions on the landscape similar to those of the Williamstown soils. They formed in 20 to 40 inches of loess. Their solum is thicker than that of the Williamstown soils. Crosby and Fincastle soils are grayer in the subsurface layer and the upper part of the subsoil than the Williamstown soils and generally are more nearly level. Also, Fincastle soils formed in thicker deposits of loess and have a thicker solum. Cyclone soils have a mollic epipedon. They are grayer throughout than the Williamstown soils. They are in depressions. Miami soils are on the higher swells. Their solum is browner than that of the Williamstown soils.

Typical pedon of Williamstown silt loam, 1 to 5 percent slopes, in a cultivated field, 1,030 feet west and 2,080 feet north of the southeast corner of sec. 23, T. 9 N., R. 8 E.

Ap—0 to 9 inches; brown (10YR 5/3) silt loam, pale brown (10YR 6/3) dry; moderate medium granular structure; friable; a few specks of yellowish brown (10YR 5/4) subsoil material; medium acid; abrupt smooth boundary.

IIB21t—9 to 18 inches; yellowish brown (10YR 5/6) clay loam; few medium distinct light brownish gray (10YR 6/2) mottles; moderate medium subangular blocky structure; firm; thin continuous dark yellowish brown (10YR 4/4) clay films on faces of peds; about 1 percent gravel; medium acid; clear wavy boundary.

IIB22t—18 to 33 inches; yellowish brown (10YR 5/6) clay loam; common medium distinct grayish brown (10YR 5/2) mottles; moderate coarse subangular blocky structure; firm; thin continuous dark yellowish brown (10YR 4/4) clay films on faces of peds; common fine black (10YR 2/1) iron and manganese oxide accumulations; slightly acid; clear wavy boundary.

IIB3t—33 to 37 inches; yellowish brown (10YR 5/6) loam; weak coarse subangular blocky structure; firm; thin discontinuous dark yellowish brown (10YR 4/4) clay films on faces of peds; slight effervescence; mildly alkaline; clear wavy boundary.

IIC—37 to 60 inches; yellowish brown (10YR 5/4) loam; common fine distinct gray (10YR 6/1) mottles; massive; firm; strong effervescence; moderately alkaline.

The solum is 30 to 40 inches thick. The loess is 4 to 19 inches thick.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. It is neutral to medium acid. The A2 horizon, if it occurs, is pale brown (10YR 6/3) or brown (10YR 5/3) silt loam that has weak to moderate, thin to thick platy structure. The B2t horizon has hue of 10YR, value of 4 or 5, and chroma of 3 to 6. It is medium acid to neutral. It is dominantly clay loam or silty clay loam, but in some pedons the lower part is loam. The B3t horizon has hue of 10YR, value of 4 to 6, and chroma of 3 to 6. It is loam or clay loam. It is slightly acid to mildly alkaline. The C horizon is yellowish brown (10YR 5/4), pale brown (10YR 6/3), or brown (10YR 5/3). It is mildly alkaline or moderately alkaline.

Xenia series

The Xenia series consists of deep, moderately well drained, moderately slowly permeable soils on loess covered glacial till plains. These soils formed in loess and the underlying glacial till. Slopes range from 0 to 4 percent.

Xenia soils are similar to Williamstown soils and are commonly adjacent to Fincastle, Miami, and Russell soils. The solum and the loess mantle of Williamstown and Miami soils are thinner than those of the Xenia soils. Williamstown soils are in positions on the landscape similar to those of the Xenia soils. Fincastle soils are grayer in the subsurface layer and the upper part of the subsoil than the Xenia soils. They are on the lower lying parts of the landscape. Miami and Russell soils are browner than the Xenia soils. They generally are on the higher parts of the landscape.

Typical pedon of Xenia silt loam, 0 to 2 percent slopes, in a cultivated field, 1,020 feet west and 60 feet north of the center of sec. 3, T. 10 N., R. 8 E.

Ap—0 to 9 inches; dark brown (10YR 3/3) silt loam, pale brown (10YR 6/3) dry; weak medium granular structure; friable; neutral; abrupt smooth boundary.

B1—9 to 12 inches; dark yellowish brown (10YR 4/4) silt loam; weak fine subangular blocky structure; firm; medium acid; abrupt wavy boundary.

B21t—12 to 19 inches; dark yellowish brown (10YR 4/4) silty clay loam; moderate medium subangular blocky structure; firm; thin continuous dark yellowish brown (10YR 4/4) clay films on faces of peds; medium acid; clear wavy boundary.

B22t—19 to 29 inches; yellowish brown (10YR 5/4) silty clay loam; common fine distinct light brownish gray (10YR 6/2) mottles; moderate medium subangular blocky structure; firm; thin continuous dark yellowish brown (10YR 4/4) clay films on faces of peds; medium acid; clear wavy boundary.

IIB23t—29 to 46 inches; yellowish brown (10YR 5/4) clay loam; common fine distinct brown (10YR 5/3) and light brownish gray (10YR 6/2) mottles; moderate coarse subangular blocky structure; firm; thin continuous dark brown (10YR 4/3) clay films on faces of peds; medium acid; gradual wavy boundary.

IIC—46 to 60 inches; brown (10YR 5/3) loam; massive; firm; slight effervescence; mildly alkaline.

The solum is 40 to 65 inches thick. The loess is 22 to 36 inches thick.

The Ap horizon is dark grayish brown (10YR 4/2), dark brown (10YR 3/3), or brown (10YR 5/3). The A2 horizon, if it occurs, is grayish brown (10YR 5/2), brown (10YR 5/3), or yellowish brown (10YR 5/4) silt loam that has weak to moderate, thin to thick platy structure. The B1 and B2t horizons have hue of 10YR, value of 4 or 5, and chroma of 3 or 4. They are silt loam or silty clay loam. They are medium acid or strongly acid. The IIB2t horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. It is strongly acid to neutral. The IIC horizon has hue of 10YR, value of 5, and chroma of 3 or 4. It is mildly alkaline or moderately alkaline.

formation of the soils

This section relates the major factors of soil formation to the soils in the county. It also describes many of the processes of soil formation.

factors of soil formation

Soils form through the physical and chemical weathering of deposited or accumulated geologic material. The characteristics of the soil are determined by the physical and mineralogical composition of the parent material, the climate during and after the accumulation of the soil material, the plant and animal life on and in the soil, the relief, and the length of time that the forces of soil formation have acted on the soil material.

Climate and plant and animal life, chiefly plants, are active factors of soil formation. They act on the parent material that has accumulated through the weathering of rocks and the deposition of sediment by glacial ice or stream water and slowly change it to a natural body that has genetically related horizons. The effects of climate and plant and animal life are conditioned by relief. The parent material affects the kind of soil profile that forms and, in extreme cases, determines it almost entirely. Finally, time is needed for changing the parent material into a soil. Some time is always required for the differentiation of soil horizons. Usually, a long time is required for the development of distinct horizons.

The factors of soil formation are so closely interrelated in their effects on the soil that few generalizations can be made regarding the effects of any one factor unless conditions are specified for the other four.

parent material

Parent material is the unconsolidated mass in which a soil forms. It determines the limits of the chemical and mineralogical composition of the soil. The dominant parent material in Decatur County was deposited as glacial till. Other parent materials in the county are loess, material weathered from bedrock, outwash material, lacustrine material, and alluvium.

Glacial till is material laid down directly by glaciers with a minimum of water action. It is a mixture of particles of different sizes. The small pebbles in glacial till have sharp corners, indicating that they have not been worn by running water. The glacial till in Decatur County is calcareous and firm. It is loam, fine sandy loam, or clay loam. Miami soils are an example of soils formed in glacial till. Typically, they are medium textured and have a strongly expressed structure.

The earliest glaciation in the county was by the Nebraskan and Kansan glaciers, the upper parts of which were entirely obliterated by the Illinoian glacier. In about one-third of the county, the soils formed in Illinoian-age loamy glacial till. The Illinoian drift is probably less than 20 feet thick in most areas in the county. Clermont, Avonburg, Rossmoyne, Cincinnati, and Hickory soils are leached of bases to a greater depth than the more recent glacial soils. Also, they have coarser structure and have a fragipan in the nearly level to strongly sloping areas. They started to form in Butlerville till about 150,000 to 120,000 years ago, during the Illinoian glaciation.

About 22,000 years ago, the Wisconsin glacier crossed the northwestern two-thirds of the county (*5*). The resulting Wisconsin till plain is commonly called the Tipton till plain. The land covered by this glacier is slightly higher in elevation than the land covered only by the previous glacier. Also, the glacier left less compact till in spots on the Shelbyville end moraine. Cyclone, Fincastle, Russell, Williamstown, and Xenia soils formed in till on the Shelbyville ground and end moraines. They are leached of bases to a lesser depth and generally have a more clayey subsoil than the soils that formed in earlier glacial till.

After retreating, about 20,000 years ago, the Wisconsin glacier readvanced in the northwest corner of the county. It formed the higher Knightstown end moraine northwest of a line from St. Omer to Germantown. Crosby, Cyclone, Miami, and Williamstown soils are on the end and ground moraines formed during this period.

Eskers formed during the latest glaciation. One is a series of high, gravelly ridges directly west of St. Omer. About 1 mile west of Burney, a small esker is oriented from north to south. Fox and Martinsville soils are the dominant soils on the eskers. The coarse material in the eskers was probably deposited in ice tunnels. Similar ice tunnels are southwest of Forest Hills. A boulder belt is on the end moraine from St. Paul to south of Germantown.

Loess was deposited in most areas of the county throughout the periods of glaciation. It has been deposited on the till since the period when the Illinoian

glacier receded. On stable landscapes, the silty Peorian loess deposited on the earlier Wisconsin till generally is 20 to 30 inches thick and that deposited on the later Wisconsin till is less than 20 inches thick. A more gritty loess or a silty drift material of till mixed with till derived from loess is as much as 100 inches thick in these areas. Loess deposition is greatest during active glacial times and is minimal during interglacial times.

Underlying the glacial till in Decatur County, to a depth of as much as 200 feet, is bedrock consolidated during three different periods. The first to be consolidated was Ordovician limestone interbedded with soft, calcareous shale, the next was Silurian limestone, and the last was Devonian limestone (fig. 16). The bedrock influenced the formation of soils in areas covered with little or no glacial till. Milton and Millsdale soils formed partly in residuum of Devonian limestone, and Grayford soils formed partly in residuum of Silurian limestone. Corydon soils also are underlain by limestone. They are in areas of each kind of limestone bedrock. In a few areas along the part of Salt Creek near Enochsburg, some of the steeper soils formed in material weathered from Ordovician limestone and shale. These areas total only about 100 acres.

Outwash material was deposited by running water from melting glaciers. The particles that make up outwash material vary in size according to the velocity of the water that carried them. When rapidly moving water slows down, the coarser particles are deposited. The finer particles, such as very fine sand, silt, and clay, can be carried by the more slowly moving water. Outwash deposits generally are layers of particles that are similar in size, such as sandy loam, sand, gravel, and other

Figure 16.—A vertical quarry wall of loess over till. The upper part of the bedrock is Silurian limestone, and the extreme lower part, near the water table, is Ordovician limestone and shale.

dominantly coarse particles. Fox, Martinsville, and Ockley soils are examples of soils formed in outwash material.

Lacustrine material was deposited from still, or ponded, glacial melt water. Because the coarser fragments drop out of moving water as outwash, only the finer particles, such as very fine sand, silt, and clay, remain and settle in the still water. Lacustrine deposits are silty or clayey. In Decatur County, the soils formed in lacustrine deposits are typically fine textured. Milford soils are an example.

Alluvium is deposited by the floodwater of streams. The texture of the material varies, depending on the speed of the water from which the material was deposited. The alluviul material deposited along a swift stream, such as the Flatrock River, is coarser textured than that deposited along a slow, sluggish stream, such as Salt Creek. An example of the coarser textured alluvial soils is Stonelick soils. An example of the finer textured alluvial soils is Chagrin soils.

plant and animal life

Plants are the principal organisms affecting the soils in Decatur County. Bacteria, fungi, earthworms, and human activities also are important. The chief contribution of plants and animal life is the addition of organic matter and nitrogen to the soil. The kind of organic material on and in the soil depends on the kinds of plants that grow on the soil. The remains of these plants accumulate on the surface, decay, and eventually become organic matter. The roots of the plants provide channels for the downward movement of water through the soil and also add organic matter as they decay. Bacteria in the soil help to break down the organic matter so that it can be used by growing plants.

The native vegetation in Decatur County was mainly deciduous trees. Differences in natural soil drainage and minor changes in parent material affected the composition of the forest species. In general, the well drained upland soils, such as Miami soils, supported sugar maple, beech, hickory, red oak, and white oak. The poorly drained upland soils, such as Clermont soils, supported pin oak, beech, and ash. The soils in Decatur County that formed dominantly under forest vegetation generally contain less organic matter than the soils that formed dominantly under grass.

climate

Climate affects the kind of plant and animal life on and in the soil. It determines the amount of water available for the weathering of minerals. Through its influence on soil temperature, it also determines the rate of chemical reaction that occurs in the soil.

The climate in Decatur County is cool and humid. It is presumably similar to the climate that existed when the soils formed. The soils differ from the soils that formed in areas where the climate is dry and warm or hot and moist. The climate is uniform throughout the county, but its effect is modified locally by runoff and aspect. Only minor differences among the soils in the county are the result of differences in climate. Detailed information on the climate is available under the heading "General nature of the county."

relief

Relief or topography has markedly affected the soils in Decatur County through its effect on natural drainage, runoff, erosion, plant cover, and soil temperature. Slopes range from nearly level to very steep. Natural soil drainage ranges from well drained on the ridgetops to very poorly drained in the depressions. Through its affect on aeration, drainage determines the color of the soil. The runoff rate is greatest on the steeper slopes and slowest in the low areas where water is temporarily ponded. Water and air move freely through well drained soils but move slowly through very poorly drained soils. Well aerated soils are brightly colored because the iron and aluminum compounds that give most soils their color are oxidized. Poorly aerated soils are dull gray and mottled. Miami soils are an example of well drained, well aerated soils, and Sloan soils are an example of very poorly drained, poorly aerated soils.

time

Time, usually a long time, is needed for the development of distinct horizons. Differences in the length of time that the parent materials have been in place are commonly reflected in the degree of profile development. Some soils form rapidly; others, slowly.

The soils in Decatur County range from young to mature. The glacial deposits in which many of the soils formed have been exposed to soil-forming factors long enough for the development of distinct horizons. An example is the Ockley soils, which have a distinct loamy subsoil. In contrast, soils that formed in recent alluvial sediments have not been in place long enough for the development of distinct horizons. The young Stonelick soils are an example.

processes of soil formation

Several processes were involved in the formation of soils in Decatur County. These processes are the accumulation of organic matter; the solution, transfer, and removal of calcium carbonates and other bases; and the liberation and translocation of silicate clay minerals. In most soils more than one of these processes has been active in the differentiation of horizons.

Some organic matter has accumulated in the surface layer of all soils in the county. The organic matter

content ranges from low to high. Generally, the soils that have the most organic matter, such as Cyclone or Sloan soils, have a thick dark surface horizon.

Carbonates and other bases have been leached from the upper horizons of nearly all of the soils. Leaching probably precedes the translocation of silicate clay minerals. Almost all of the carbonates and some of the bases have been leached from the A and B horizons of well drained soils. Even in the wettest soils, some leaching is indicated by the absence of carbonates and by an acid or neutral reaction. Leaching is slow in wet soils because of a high water table or because water moves slowly through such soils.

Leaching of bases and translocation of silicate clays are among the more important processes affecting horizon differentiation in the soils. Clay accumulates in pores and other voids, and clay films form on the surfaces along which water moves. Miami soils are an example of soils in which translocated silicate clays have accumulated in the B2t horizon in the form of clay films.

The reduction and transfer of iron, a process called gleying, has significantly differentiated the horizons in very poorly drained or poorly drained soils. As a result of this process, the subsoil of these soils generally is grayish. The poorly drained Clermont soils are an example. Reduction is commonly accompanied by some transfer of the iron from the upper horizons either to the lower horizons or completely out of the profile. Mottles, spots, or flecks that differ in color from the matrix indicate the redistribution and segregation of iron.

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glossary

ABC soil. A soil having an A, a B, and a C horizon.

Ablation till. Loose, permeable till deposited during the final downwasting of glacial ice. Lenses of crudely sorted sand and gravel are common.

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Association, soil. A group of soils geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as—

	Inches
Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	more than 12

Basal till. Compact glacial till deposited beneath the ice.

Base saturation. The degree to which material having cation exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, K), expressed as a percentage of the total cation exchange capacity.

Bedding planes. Fine stratifications, less than 5 millimeters thick, in unconsolidated alluvial, eolian, lacustrine, or marine sediments.

Bedding ridges. Beds created by draining the soil through a series of broad beds made by plowing, grading, or otherwise elevating the surface of a flat field.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bottom land. The normal flood plain of a stream, subject to flooding.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Capillary water. Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity, but is more precise in meaning.

Channery soil. A soil that is, by volume, more than 15 percent thin, flat fragments of sandstone, shale, slate, limestone, or schist as much as 6 inches along the longest axis. A single piece is called a fragment.

Chiseling. Tillage with an implement having one or more soil-penetrating points that shatter or loosen hard, compact layers to depths below normal plow depth.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Coarse fragments. If round, mineral or rock particles 2 millimeters to 25 centimeters (10 inches) in diameter; if flat, mineral or rock particles (flagstone) 15.2 to 38.1 centimeters (6 to 15 inches) long.

Coarse textured soil. Sand or loamy sand.

Colluvium. Soil material, rock fragments, or both moved by creep, slide, or local wash and deposited at the base of steep slopes.

Complex slope. Irregular or variable slope. Planning or constructing terraces, diversions, and other water-control measures on a complex slope is difficult.

Complex, soil. A map unit of two or more kinds of soil in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils are somewhat similar in all areas.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

Conservation tillage. A tillage system that does not invert the soil and that leaves a protective amount of crop residue on the surface throughout the year.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard; little affected by moistening.

Contour stripcropping. Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Coprogenous earth (sedimentary peat). Fecal material deposited in water by aquatic organisms. The Lco horizon is a limnic layer that contains many fecal pellets.

Corrosive. High risk of corrosion to uncoated steel or deterioration of concrete.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Deferred grazing. Postponing grazing or resting grazing land for a prescribed period.

Dense layer (in tables). A very firm, massive layer that has a bulk density of more than 1.8 grams per cubic centimeter. Such a layer affects the ease of digging and can affect filling and compacting.

Depth to rock (in tables). Bedrock is too near the surface for the specified use.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Drainage class (natural). Refers to the removal of water from the soil. Drainage classes are determined on the basis of an overall evaluation of water removal as influenced by climate, slope, and position on the landscape. Precipitation, runoff, amount of moisture infiltrating the soil, and rate of water movement through the soil affect the degree and duration of wetness. Seven classes of natural soil drainage are recognized:

Excessively drained.—Water is removed from the soil very rapidly. The soils in this class generally are free of mottles throughout. They commonly are shallow, very porous, or steep, or a combination of these.

Somewhat excessively drained.—Water is removed from the soil rapidly. The soils in this class generally are free of mottles throughout. They commonly are shallow or moderately deep, very porous, or steep, or a combination of these.

Well drained.—Water is removed from the soil so readily that the upper 40 inches generally does not have the mottles or dull colors related to wetness.

Moderately well drained.—Water is removed from the soil so slowly that the upper 20 to 40 inches has the mottles or dull colors related to wetness. The soils in this class commonly have a slowly permeable layer, have a water table, or receive runoff or seepage, or they are characterized by a combination of these.

Somewhat poorly drained.—Water is removed from the soil so slowly that the upper 10 to 20 inches has the mottles or dull colors related to wetness. The soils in this class commonly have a slowly permeable layer, have a water table, or receive runoff or seepage, or they are characterized by a combination of these.

Poorly drained.—Water is removed so slowly that either the soil is periodically saturated or the upper

10 inches has the mottles or dull colors related to wetness. The soils in this class commonly have a slowly permeable layer, have a water table, or receive runoff or seepage, or they are characterized by a combination of these.

Very poorly drained.—Water is removed from the soil so slowly that free water is at or on the surface most of the time. The soils in this class commonly have a slowly permeable layer, have a water table, or receive runoff or seepage, or they are characterized by a combination of these.

Drainage, surface. Runoff, or surface flow of water, from an area.

Drainage, subsurface. Removal of excess ground water through buried drains installed within the soil profile. The drains collect the water and convey it to a gravity or pump outlet.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Eolian soil material. Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of the activities of man or other animals or of a catastrophe in nature, for example, fire, that exposes the surface.

Esker (geology). A narrow, winding ridge of stratified gravelly and sandy drift deposited by a stream flowing in a tunnel beneath a glacier.

Excess fines (in tables). Excess silt and clay in the soil. The soil does not provide a source of gravel or sand for construction purposes.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity.*

Fine textured soil. Sandy clay, silty clay, and clay.

First bottom. The normal flood plain of a stream, subject to frequent or occasional flooding.

Flagstone. A thin fragment of sandstone, limestone, slate, shale, or (rarely) schist, 6 to 15 inches (15 to 37.5 centimeters) long.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Foot slope. The inclined surface at the base of a hill.

Fragipan. A loamy, brittle subsurface horizon low in porosity and content of organic matter and low or moderate in clay but high in silt or very fine sand. A fragipan appears cemented and restricts roots. When dry, it is hard or very hard and has a higher bulk density than the horizon or horizons above. When moist, it tends to rupture suddenly under pressure rather than to deform slowly.

Frost action (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Glacial drift (geology). Pulverized and other rock material transported by glacial ice and then deposited. Also the sorted and unsorted material deposited by streams flowing from glaciers.

Glacial outwash (geology). Gravel, sand, and silt, commonly stratified, deposited by glacial melt water.

Glacial till (geology). Unsorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors and mottles.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock up to 3 inches (2 millimeters to 7.5 centimeters) in diameter. An individual piece is a pebble.

Green manure crop (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water (geology). Water filling all the unblocked pores of underlying material below the water table.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an uppercase letter represents the major horizons. Numbers or lowercase letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the *Soil Survey Manual*. The major horizons of mineral soil are as follows:

O horizon.—An organic layer of fresh and decaying plant residue at the surface of a mineral soil.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these. The combined A and B horizons are generally called the solum, or true soil. If a soil does not have a B horizon, the A horizon alone is the solum.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the A or B horizon. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, the Roman numeral II precedes the letter C.

R layer.—Consolidated rock beneath the soil. The rock commonly underlies a C horizon, but can be directly below an A or a B horizon.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Illuviation. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are—

Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Basin.—Water is applied rapidly to nearly level plains surrounded by levees or dikes.

Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.

Drip (or trickle).—Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.

Furrow.—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Wild flooding.—Water, released at high points, is allowed to flow onto an area without controlled distribution.

Kame (geology). An irregular, short ridge or hill of stratified glacial drift.

Lacustrine deposit (geology). Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.

Leaching. The removal of soluble material from soil or other material by percolating water.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles,

28 to 50 percent silt particles, and less than 52 percent sand particles.

Loess. Fine grained material, dominantly of silt-sized particles, deposited by wind.

Low strength. The soil is not strong enough to support loads.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

Moderately coarse textured soil. Sandy loam and fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, and silty clay loam.

Moraine (geology). An accumulation of earth, stones, and other debris deposited by a glacier. Some types are terminal, lateral, medial, and ground.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few, common,* and *many*; size—*fine, medium,* and *coarse*; and contrast—*faint, distinct,* and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium*, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse*, more than 15 millimeters (about 0.6 inch).

Munsell notation. A designation of color by degrees of the three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color of 10YR hue, value of 6, and chroma of 4.

Neutral soil. A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Organic matter. Plant and animal residue in the soil in various stages of decomposition.

Outwash, glacial. Stratified sand and gravel produced by glaciers and carried, sorted, and deposited by glacial melt water.

Outwash plain. A landform of mainly sandy or coarse textured material of glaciofluvial origin. An outwash plain is commonly smooth; where pitted, it is generally low in relief.

Pan. A compact, dense layer in a soil that impedes the movement of water and the growth of roots. For example, *hardpan, fragipan, claypan, plowpan,* and *traffic pan*.

Parent material. The unconsolidated organic and mineral material in which soil forms.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The downward movement of water through the soil.

Percs slowly (in tables). The slow movement of water through the soil adversely affecting the specified use.

Permeability. The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

Very slow	less than 0.06 inch
Slow	0.06 to 0.2 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management. For example, slope, stoniness, and thickness.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Plowpan. A compacted layer formed in the soil directly below the plowed layer.

Ponding. Standing water on soils in closed depressions. The water can be removed only by percolation or evapotranspiration.

Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Poor filter (in tables). Because of rapid permeability, the soil may not adequately filter effluent from a waste disposal system.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degree of acidity or alkalinity is expressed as—

	pH
Extremely acid	below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated, weathered, or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

Rill. A steep sided channel resulting from accelerated erosion. A rill is generally a few inches deep and not wide enough to be an obstacle to farm machinery.

Rippable. Bedrock or hardpan can be excavated using a single-tooth ripping attachment mounted on a tractor with a 200-300 draw bar horsepower rating.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Seed tree. A tree that produces seed, generally a superior tree left standing at the time of cutting to produce seed for reforestation.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Sequum. A sequence consisting of an illuvial horizon and the overlying eluvial horizon. (See Eluviation.)

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer or of the substratum. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and runoff.

Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Sinkhole. A depression in the landscape where limestone has been dissolved.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75 feet.

Slope (in tables). Slope is great enough that special practices are required to insure satisfactory performance of the soil for a specific use.

Slow refill (in tables). The slow filling of ponds, resulting from restricted permeability in the soil.

Small stones (in tables). Rock fragments less than 3 inches (7.5 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 mm in equivalent diameter and ranging between specified size limits. The names and sizes of separates recognized in the United States are as follows:

	Millimeters
Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and plant and animal activities are largely confined to the solum.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grain* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the profile below plow depth.

Substratum. The part of the soil below the solum.

Subsurface layer. Any surface soil horizon (A1, A2, or A3) below the surface layer.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Surface soil. The A horizon. Includes all subdivisions of this horizon (A1, A2, and A3).

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior.

Terminal moraine. A belt of thick glacial drift that generally marks the termination of important glacial advances.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). Otherwise suitable soil material too thin for the specified use.

Till plain. An extensive flat to undulating area underlain by glacial till.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Toe slope. The outermost inclined surface at the base of a hill; part of a foot slope.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Variant, soil. A soil having properties sufficiently different from those of other known soils to justify a new series name, but occurring in such a limited geographic area that creation of a new series is not justified.

Variegation. Refers to patterns of contrasting colors assumed to be inherited from the parent material rather than to be the result of poor drainage.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Well graded. Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Wilting point (or permanent wilting point). The moisture content of soil, on an ovendry basis, at which a plant (specifically sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

tables

TABLE 1.--TEMPERATURE AND PRECIPITATION

[Recorded in the period 1951-76 at Greensburg, Indiana]

Month	Temperature						Precipitation				
	Average daily maximum	Average daily minimum	Average daily	2 years in 10 will have-- Maximum temperature higher than--	2 years in 10 will have-- Minimum temperature lower than--	Average number of growing degree days*	Average	2 years in 10 will have-- Less than--	2 years in 10 will have-- More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January----	38.1	19.1	28.6	66	-17	21	2.61	1.23	3.74	5	4.4
February---	42.3	22.3	32.3	67	-11	40	2.60	1.04	3.84	5	3.3
March------	51.4	29.9	40.7	78	5	170	3.67	1.70	5.27	7	3.6
April------	64.6	40.4	52.5	84	19	379	4.14	2.18	5.74	9	.2
May--------	73.9	49.2	61.6	90	26	670	4.62	2.42	6.41	8	.0
June-------	82.4	58.1	70.3	95	39	909	3.99	2.41	5.40	7	.0
July-------	85.6	61.1	73.3	96	44	1,032	4.23	2.29	5.82	7	.0
August-----	84.4	58.7	71.6	96	43	980	2.86	1.28	4.14	5	.0
September--	78.6	52.3	65.5	95	31	765	2.86	1.20	4.19	6	.0
October----	67.8	41.0	54.4	88	18	446	2.35	1.15	3.32	5	.0
November---	52.1	31.3	41.7	77	6	121	3.05	1.68	4.16	6	2.0
December---	40.9	23.0	32.0	67	-10	62	2.90	1.04	4.37	5	3.1
Yearly:											
Average--	63.5	40.5	52.0	---	---	---	---	---	---	---	---
Extreme--	---	---	---	99	-19	---	---	---	---	---	---
Total----	---	---	---	---	---	5,595	39.88	34.04	45.82	75	16.6

* Growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (40° F).

TABLE 2.--FREEZE DATES IN SPRING AND FALL

[Recorded in the period 1951-76 at Greensburg, Indiana]

Probability	Temperature		
	24° F or lower	28° F or lower	32° F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	April 26	May 11	May 21
2 years in 10 later than--	April 21	May 5	May 15
5 years in 10 later than--	April 11	April 23	May 5
First freezing temperature in fall:			
1 year in 10 earlier than--	October 13	October 2	September 20
2 years in 10 earlier than--	October 18	October 7	September 25
5 years in 10 earlier than--	October 28	October 16	October 6

TABLE 3.--GROWING SEASON

[Recorded in the period 1951-76 at Greensburg, Indiana]

Probability	Daily minimum temperature during growing season		
	Higher than 24° F	Higher than 28° F	Higher than 32° F
	Days	Days	Days
9 years in 10	180	151	132
8 years in 10	186	159	139
5 years in 10	199	175	153
2 years in 10	212	190	167
1 year in 10	219	198	174

TABLE 4.--POTENTIAL AND LIMITATIONS OF MAP UNITS ON THE GENERAL SOIL MAP

Map unit	Extent of area	Cultivated crops	Woodland	Urban uses
	Pct			
1. Chagrin-Lobdell-Orrville	5	Good	Good	Poor: flooding, wetness.
2. Ockley-Martinsville-Fox	2	Good	Good	Good.
3. Crosby-Cyclone-Miami	2	Good	Good	Poor: wetness.
4. Fincastle-Cyclone-Xenia	36	Good	Good	Poor: wetness.
5. Clermont-Avonburg	13	Fair: wetness.	Fair: wetness.	Poor: wetness.
6. Cincinnati-Rossmoyne-Hickory	16	Good to poor: slope.	Good	Poor: slope, rooting depth.
7. Miami-Xenia-Williamstown	26	Good to poor: slope.	Good	Poor: slope.

TABLE 5.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
AvA	Avonburg silt loam, 0 to 2 percent slopes	15,200	6.4
AvB	Avonburg silt loam, 2 to 4 percent slopes	1,685	0.7
Cg	Chagrin loam, frequently flooded	6,255	2.6
Ch	Chagrin Variant silt loam, frequently flooded	300	0.1
CkB2	Cincinnati silt loam, 2 to 6 percent slopes, eroded	1,860	0.8
CkC2	Cincinnati silt loam, 6 to 12 percent slopes, eroded	2,190	0.9
CkC3	Cincinnati silt loam, 6 to 12 percent slopes, severely eroded	8,160	3.5
Cm	Clermont silt loam	15,905	6.7
CnG	Corydon-Rock outcrop complex, 15 to 35 percent slopes	600	0.3
CrA	Crosby silt loam, 0 to 3 percent slopes	4,875	2.1
Cy	Cyclone silt loam	28,090	11.9
FcA	Fincastle silt loam, 0 to 2 percent slopes	38,035	16.1
FcB	Fincastle silt loam, 2 to 4 percent slopes	2,505	1.1
FoA	Fox loam, 0 to 2 percent slopes	290	0.1
FoB	Fox loam, 2 to 6 percent slopes	350	0.2
GfD	Grayford silt loam, 10 to 20 percent slopes	775	0.3
GrC2	Grayford-Ryker silt loams, 4 to 10 percent slopes, eroded	1,185	0.5
HeG	Hennepin loam, 35 to 60 percent slopes	3,305	1.4
HkD2	Hickory loam, 12 to 18 percent slopes, eroded	725	0.3
HkE2	Hickory loam, 18 to 25 percent slopes, eroded	2,640	1.1
HkF	Hickory loam, 25 to 50 percent slopes	1,190	0.5
HlD3	Hickory clay loam, 12 to 18 percent slopes, severely eroded	1,275	0.5
Lb	Lobdell silt loam, frequently flooded	5,040	2.1
MeA	Martinsville loam, 0 to 2 percent slopes	680	0.3
MeB2	Martinsville loam, 2 to 6 percent slopes, eroded	560	0.2
MmB2	Miami silt loam, 2 to 6 percent slopes, eroded	11,155	4.7
MmC2	Miami silt loam, 6 to 12 percent slopes, eroded	1,530	0.7
MmD2	Miami silt loam, 12 to 18 percent slopes, eroded	1,225	0.5
MoC3	Miami clay loam, 6 to 12 percent slopes, severely eroded	12,675	5.4
MoD3	Miami clay loam, 12 to 18 percent slopes, severely eroded	2,320	1.0
Mr	Milford silty clay	250	0.1
Ms	Millsdale silty clay loam	540	0.2
MtA	Milton silt loam, 0 to 2 percent slopes	435	0.2
MtB2	Milton silt loam, 2 to 6 percent slopes, eroded	450	0.2
My	Montgomery silty clay, gravelly substratum	315	0.1
OcA	Ockley silt loam, 0 to 2 percent slopes	730	0.3
OcB	Ockley silt loam, 2 to 6 percent slopes	785	0.3
Or	Orrville silt loam, frequently flooded	7,855	3.3
RoG	Rodman gravelly sandy loam, 35 to 60 percent slopes	130	0.1
RsB2	Rossmoyne silt loam, 2 to 6 percent slopes, eroded	11,840	5.0
RuB	Russell silt loam, 1 to 5 percent slopes	5,540	2.3
So	Sloan silt loam, frequently flooded	750	0.3
Sr	Starks silt loam	575	0.2
St	Stonelick fine sandy loam, frequently flooded	570	0.2
Ud	Udorthents-Pits complex	180	0.1
WmB	Williamstown silt loam, 1 to 5 percent slopes	12,825	5.5
XnA	Xenia silt loam, 0 to 2 percent slopes	7,735	3.3
XnB	Xenia silt loam, 2 to 4 percent slopes	11,900	5.0
	Water	815	0.3
	Total	236,800	100.0

TABLE 6.--YIELDS PER ACRE OF CROPS AND PASTURE

[Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil]

Soil name and map symbol	Corn	Soybeans	Winter wheat	Grass-legume hay	Tall fescue
	Bu	Bu	Bu	Ton	AUM*
AvA------ Avonburg	95	38	40	3.9	7.4
AvB------ Avonburg	92	36	38	4.0	7.8
Cg------ Chagrin	115	32	53	3.0	7.2
Ch------ Chagrin Variant	105	30	35	3.0	7.2
CkB2------ Cincinnati	90	32	42	4.2	8.0
CkC2------ Cincinnati	85	30	38	4.5	7.6
CkC3------ Cincinnati	80	28	34	3.7	7.1
Cm------ Clermont	110	35	35	3.8	7.2
CnG------ Corydon-Rock outcrop	---	---	---	---	4.0
CrA------ Crosby	115	42	42	3.9	7.4
Cy------ Cyclone	145	52	60	4.8	9.1
FcA------ Fincastle	135	46	50	4.3	8.2
FcB------ Fincastle	125	44	48	4.3	8.2
FoA------ Fox	90	32	40	3.0	5.7
FoB------ Fox	85	30	35	2.9	5.5
GfD------ Grayford	85	30	36	4.1	7.8
GrC2------ Grayford-Ryker	95	37	40	3.5	8.6
HeG------ Hennepin	---	---	---	2.2	4.2
HkD2------ Hickory	74	24	27	2.8	7.6
HkE2------ Hickory	---	---	---	3.3	6.1
HkF------ Hickory	---	---	---	2.6	5.0

See footnote at end of table.

TABLE 6.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Corn	Soybeans	Winter wheat	Grass-legume hay	Tall fescue
	Bu	Bu	Bu	Ton	AUM*
HlD3: Hickory	70	20	25	2.5	6.5
Lb: Lobdell	112	38	40	4.8	9.1
MeA: Martinsville	115	42	45	4.9	9.3
MeB2: Martinsville	115	40	43	4.8	9.1
MmB2: Miami	105	37	42	4.1	7.8
MmC2: Miami	95	33	38	3.9	7.4
MmD2: Miami	90	28	34	3.5	6.7
MoC3: Miami	90	30	33	3.7	7.1
MoD3: Miami	75	20	28	3.0	6.3
Mr: Milford	130	45	45	4.6	8.8
Ms: Millsdale	120	45	45	4.0	7.6
MtA: Milton	100	33	40	3.9	7.4
MtB2: Milton	95	30	40	3.8	7.3
My: Montgomery	130	40	42	4.6	8.8
OcA: Ockley	110	38	44	4.8	9.1
OcB: Ockley	105	37	42	4.7	9.0
Or: Orrville	90	35	35	4.3	8.2
RoG: Rodman	---	---	---	0.2	0.4
RsB2: Rossmoyne	90	35	44	4.2	8.0
RuB: Russell	115	43	55	4.8	9.1
So: Sloan	80	35	20	4.5	8.6
Sr: Starks	125	46	51	4.6	8.8
St: Stonelick	75	25	30	3.5	6.7

See footnote at end of table.

TABLE 6.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Corn	Soybeans	Winter wheat	Grass-legume hay	Tall fescue
	Bu	Bu	Bu	Ton	AUM*
Ud. Udorthents-Pits					
WmB Williamstown	110	40	45	4.0	7.8
XnA Xenia	120	44	54	4.8	9.1
XnB Xenia	115	43	52	4.7	9.0

* Animal-unit-month: The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for 30 days.

TABLE 7.--CAPABILITY CLASSES AND SUBCLASSES

[Miscellaneous areas are excluded. Absence of an entry indicates no acreage]

Class	Total acreage	Major management concerns (Subclass)		
		Erosion (e)	Wetness (w)	Soil problem (s)
		Acres	Acres	Acres
I	9,145	---	---	---
II	157,375	61,455	95,195	725
III	34,265	4,905	29,360	---
IV	22,785	22,785	---	---
V	---	---	---	---
VI	7,010	7,010	---	---
VII	5,405	5,275	---	130
VIII	---	---	---	---

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY

[Only the soils suitable for production of commercial trees are listed. Absence of an entry indicates that information was not available]

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Management concerns: Equipment limitation	Management concerns: Seedling mortality	Management concerns: Windthrow hazard	Potential productivity: Common trees	Potential productivity: Site index	Trees to plant
AvA, AvB----------- Avonburg	3d	Slight	Slight	Moderate	Moderate	White oak----------- Northern red oak---- Pin oak------------- Yellow-poplar------- Sweetgum------------	70 75 85 85 80	Eastern white pine, baldcypress, white ash, red maple, yellow-poplar, American sycamore.
Cg----------------- Chagrin	1o	Slight	Slight	Slight	Slight	Northern red oak---- Yellow-poplar------- Sugar maple--------- White oak----------- Black cherry-------- White ash----------- Black walnut--------	86 96 86 --- --- --- ---	Eastern white pine, black walnut, yellow-poplar, white ash, red pine, northern red oak, white oak.
Ch----------------- Chagrin Variant	1d	Slight	Slight	Slight	Moderate	Yellow-poplar------- White oak-----------	90 80	Baldcypress, yellow-poplar, white oak.
CkB2, CkC2, CkC3--- Cincinnati	2d	Slight	Slight	Moderate	Moderate	Northern red oak---- White oak----------- Black walnut-------- Black cherry-------- Sugar maple--------- White ash----------- Yellow-poplar-------	80 --- --- --- --- --- ---	Eastern white pine, black walnut, yellow-poplar, white ash, red pine, northern red oak, white oak.
Cm----------------- Clermont	2w	Slight	Severe	Moderate	Moderate	Pin oak------------- Sweetgum------------ Eastern white pine-- Green ash----------- Black cherry-------- Eastern cottonwood-- Red maple----------- Swamp white oak-----	86 67 93 --- --- --- --- ---	Sweetgum, baldcypress, red maple, green ash, American sycamore, eastern cottonwood, pin oak, swamp white oak.
CnG*:								
Corydon------------	5d	Moderate	Moderate	Severe	Moderate	White oak----------- Northern red oak---- White ash----------- Shagbark hickory----	48 --- --- ---	White oak, northern red oak, white ash.
Rock outcrop.								
CrA---------------- Crosby	3o	Slight	Slight	Slight	Slight	White oak----------- Pin oak------------- Yellow-poplar------- Sweetgum------------ Northern red oak----	75 85 85 80 75	Eastern white pine, baldcypress, white ash, red maple, yellow-poplar, American sycamore.
Cy----------------- Cyclone	2w	Slight	Severe	Severe	Severe	Pin oak------------- White oak----------- Sweetgum------------	90 75 90	Eastern white pine, baldcypress, Norway spruce, red maple, white ash, sweetgum.
FcA, FcB----------- Fincastle	3o	Slight	Slight	Slight	Slight	Northern red oak---- White oak----------- Pin oak------------- Yellow-poplar------- Sweetgum------------	75 75 85 85 80	Eastern white pine, baldcypress, white ash, red maple, yellow-poplar, American sycamore.
FoA, FoB----------- Fox	2o	Slight	Slight	Slight	Slight	Northern red oak---- White oak----------- Sugar maple---------	80 --- ---	Yellow-poplar, white ash, eastern white pine, red pine, black locust.

See footnote at end of table.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Potential productivity: Common trees	Site index	Trees to plant
GfD: Grayford	1o	Slight	Slight	Slight	Slight	White oak	90	Eastern white pine, red pine, black walnut, yellow-poplar, white ash.
						Yellow-poplar	98	
						Sweetgum	76	
GrC2*:								
Grayford	1o	Slight	Slight	Slight	Slight	White oak	90	Eastern white pine, red pine, black walnut, yellow-poplar, white ash.
						Yellow-poplar	98	
						Sweetgum	76	
Ryker	1o	Slight	Slight	Slight	Slight	White oak	90	Eastern white pine, red pine, black walnut, yellow-poplar, white ash, black locust.
						Yellow-poplar	98	
						Sweetgum	76	
HeG: Hennepin	1r	Severe	Severe	Slight	Slight	Northern red oak	85	Northern red oak, white oak, green ash, black walnut, eastern white pine, red pine.
						White oak	---	
HkD2: Hickory	1o	Slight	Slight	Slight	Slight	White oak	86	Eastern white pine, red pine, yellow-poplar, sugar maple, white oak, black walnut.
						Northern red oak	86	
						Black oak	---	
						Green ash	---	
						Bitternut hickory	---	
						Yellow-poplar	95	
HkE2: Hickory	1r	Moderate	Moderate	Slight	Slight	White oak	85	Eastern white pine, red pine, yellow-poplar, sugar maple, white oak, black walnut.
						Northern red oak	85	
						Black oak	---	
						Green ash	---	
						Bitternut hickory	---	
						Yellow-poplar	95	
HkF: Hickory	1r	Severe	Severe	Slight	Slight	White oak	85	Eastern white pine, red pine, yellow-poplar, sugar maple, white oak, black walnut.
						Northern red oak	85	
						Black oak	---	
						Green ash	---	
						Bitternut hickory	---	
						Yellow-poplar	95	
HlD3: Hickory	1o	Slight	Slight	Slight	Slight	White oak	85	Eastern white pine, red pine, yellow-poplar, sugar maple, white oak, black walnut.
						Northern red oak	85	
						Black oak	---	
						Green ash	---	
						Bitternut hickory	---	
						Yellow-poplar	95	
Lb: Lobdell	1o	Slight	Slight	Slight	Slight	Northern red oak	87	Eastern white pine, black walnut, yellow-poplar, white ash, red pine, northern red oak, white oak.
						Yellow-poplar	96	
						Sugar maple	---	
						Black walnut	---	
						White oak	---	
						Black cherry	---	
						White ash	---	
MeA, MeB2: Martinsville	1o	Slight	Slight	Slight	Slight	White oak	90	Eastern white pine, red pine, white ash, yellow-poplar, black walnut, black locust.
						Yellow-poplar	98	
						Sweetgum	76	

See footnote at end of table.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Management concerns: Equipment limitation	Management concerns: Seedling mortality	Management concerns: Windthrow hazard	Potential productivity: Common trees	Potential productivity: Site index	Trees to plant
MmB2, MmC2, MmD2, MoC3, MoD3 Miami	1o	Slight	Slight	Slight	Slight	White oak Yellow-poplar Sweetgum	90 98 76	Eastern white pine, red pine, white ash, yellow-poplar, black walnut.
Mr Milford	3w	Slight	Severe	Severe	Severe	Pin oak Sweetgum Green ash Red maple	--- --- --- ---	Pin oak, green ash, eastern hemlock, red maple.
Ms Millsdale	2w	Slight	Severe	Severe	Severe	Pin oak Red maple Eastern cottonwood Black cherry Green ash Swamp white oak	86 --- --- --- --- ---	Red maple, American sycamore, eastern cottonwood, pin oak, green ash, swamp white oak, baldcypress.
MtA, MtB2 Milton	2o	Slight	Slight	Slight	Slight	Northern red oak Yellow-poplar Black walnut Black cherry White oak White ash Sugar maple	80 95 --- --- --- --- ---	Eastern white pine, black walnut, yellow-poplar, white ash, red pine, northern red oak, white oak.
My Montgomery	2w	Slight	Severe	Severe	Severe	Pin oak Sweetgum White oak	88 90 75	Eastern white pine, sweetgum, red maple.
OcA, OcB Ockley	1o	Slight	Slight	Slight	Slight	White oak Northern red oak Yellow-poplar Sweetgum	90 90 98 76	Eastern white pine, red pine, white ash, yellow-poplar, black walnut, black locust.
Or Orrville	2o	Slight	Slight	Slight	Slight	Pin oak Northern red oak Yellow-poplar Sugar maple White oak Black walnut Black cherry White ash	85 80 90 80 --- --- --- ---	Eastern white pine, yellow-poplar, black walnut, red pine, white ash, white oak.
RoG Rodman	3s	Severe	Severe	Severe	Slight	Northern red oak White oak Red pine Eastern white pine	70 70 75 85	Eastern white pine, red pine, jack pine.
RsB2 Rossmoyne	2d	Slight	Slight	Moderate	Moderate	Northern red oak White ash White oak Sugar maple Slippery elm American beech American sycamore	80 --- --- --- --- --- ---	Green ash, Virginia pine, yellow-poplar, red pine.
RuB Russell	1o	Slight	Slight	Slight	Slight	White oak Northern red oak Yellow-poplar Sweetgum	90 90 98 76	Eastern white pine, red pine, white ash, yellow-poplar, black walnut, black locust.

See footnote at end of table.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Management concerns: Equipment limitation	Management concerns: Seedling mortality	Management concerns: Windthrow hazard	Potential productivity: Common trees	Potential productivity: Site index	Trees to plant
So----------------- Sloan	2w	Slight	Severe	Severe	Severe	Pin oak------------- Swamp white oak----- Red maple----------- Green ash----------- Eastern cottonwood--	86 --- --- --- ---	Red maple, white ash, eastern cottonwood, pin oak, swamp white oak.
Sr----------------- Starks	2o	Slight	Slight	Slight	Slight	White oak----------- Northern red oak---- Yellow-poplar------- Black walnut--------	80 80 90 ---	Black walnut, American sycamore, yellow-poplar, white oak, green ash, sugar maple.
St----------------- Stonelick	2o	Slight	Slight	Slight	Slight	Northern red oak---- White oak----------- Black walnut-------- Black cherry-------- Sugar maple--------- White ash----------- Yellow-poplar-------	80 --- --- --- --- --- ---	Eastern white pine, black walnut, yellow-poplar, white ash, red pine, white oak.
WmB---------------- Williamstown	1o	Slight	Slight	Slight	Slight	White oak----------- Yellow-poplar------- White ash-----------	85 100 85	Black walnut, white oak, yellow-poplar.
XnA, XnB----------- Xenia	1o	Slight	Slight	Slight	Slight	White oak----------- Yellow-poplar------- Sweetgum------------	90 98 76	Eastern white pine, red pine, black walnut, black locust, yellow-poplar, white ash.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 9.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS

[The symbol < means less than; > means more than. Absence of an entry indicates that trees generally do not grow to the given height on that soil]

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of--				
	<8	8-15	16-25	26-35	>35
AvA, AvB: Avonburg	---	Arrowwood, eastern redcedar, Washington hawthorn, Amur honeysuckle, American cranberrybush, Amur privet, Tatarian honeysuckle.	Austrian pine, green ash, osageorange.	Eastern white pine, pin oak.	---
Cg: Chagrin	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Austrian pine, white fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce	Eastern white pine, pin oak.
Ch: Chagrin Variant	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Austrian pine, white fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce	Eastern white pine, pin oak.
CkB2, CkC2, CkC3: Cincinnati	---	Eastern redcedar, Washington hawthorn, Tatarian honeysuckle, Amur privet, Amur honeysuckle, arrowwood, American cranberrybush.	Green ash, Austrian pine, osageorange.	Pin oak, eastern white pine.	---
Cm: Clermont	---	Silky dogwood, American cranberrybush, Amur honeysuckle, Amur privet.	Northern white-cedar, Washington hawthorn, white fir, blue spruce, Austrian pine, Norway spruce.	Eastern white pine	Pin oak.
CnG*: Corydon.					
Rock outcrop.					
CrA: Crosby	---	Arrowwood, eastern redcedar, Washington hawthorn, Amur honeysuckle, American cranberrybush, Amur privet, Tatarian honeysuckle.	Austrian pine, green ash, osageorange.	Eastern white pine, pin oak.	---
Cy: Cyclone	---	Amur honeysuckle, silky dogwood, Amur privet.	Northern white-cedar, Norway spruce, Austrian pine, blue spruce, white fir, Washington hawthorn.	Eastern white pine	---

See footnote at end of table.

TABLE 9.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of--				
	<8	8-15	16-25	26-35	>35
FcA, FcB. Fincastle	---	Amur honeysuckle, American cranberrybush, Amur privet, silky dogwood.	Austrian pine, white fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce	Eastern white pine, pin oak.
FoA, FoB. Fox	Siberian peashrub	Autumn-olive, Amur honeysuckle, eastern redcedar, radiant crabapple, Washington hawthorn, lilac, Tatarian honeysuckle.	Eastern white pine, Austrian pine, red pine, jack pine.	---	---
GfD. Grayford	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	White fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
GrC2*:					
Grayford	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	White fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
Ryker	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	White fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
HeG. Hennepin	---	Tatarian honeysuckle, Siberian peashrub.	White spruce, blue spruce, northern white-cedar, Washington hawthorn, green ash, eastern redcedar.	---	---
HkD2. Hickory	---	Silky dogwood, American cranberrybush, Amur honeysuckle, Amur privet.	White fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
HkE2, HkF. Hickory					
HlD3. Hickory	---	Silky dogwood, American cranberrybush, Amur honeysuckle, Amur privet.	White fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
Lb. Lobdell	---	Silky dogwood, Amur honeysuckle, Amur privet, American cranberrybush.	Northern white-cedar, Austrian pine, white fir, blue spruce, Washington hawthorn.	Norway spruce	Pin oak, eastern white pine.
MeA, MeB2. Martinsville	---	Amur honeysuckle, American cranberrybush, Amur privet, silky dogwood.	White fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.

See footnote at end of table.

TABLE 9.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of-- <8	8-15	16-25	26-35	>35
MmB2, MmC2, MmD2, MoC3, MoD3: Miami	---	Amur honeysuckle, Amur privet, American cranberrybush, silky dogwood.	White fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
Mr: Milford	---	Silky dogwood, American cranberrybush, Amur honeysuckle, Amur privet.	Washington hawthorn, white fir, blue spruce, northern white-cedar, Austrian pine, Norway spruce.	Eastern white pine	Pin oak.
Ms: Millsdale	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	Northern white-cedar, Norway spruce, Austrian pine, blue spruce, white fir, Washington hawthorn.	Eastern white pine	Pin oak.
MtA, MtB2: Milton	Siberian peashrub	Eastern redcedar, radiant crabapple, Washington hawthorn, autumn-olive, Amur honeysuckle, lilac, Tatarian honeysuckle.	Eastern white pine, Austrian pine, red pine, jack pine.	---	---
My: Montgomery	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Norway spruce, Austrian pine, northern white-cedar, blue spruce, white fir, Washington hawthorn.	Eastern white pine	Pin oak.
OcA, OcB: Ockley	---	Amur honeysuckle, American cranberrybush, Amur privet, silky dogwood.	White fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
Or: Orrville	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Austrian pine, white fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce	Eastern white pine, pin oak.
RoG. Rodman					
RsB2: Rossmoyne	---	Washington hawthorn, Amur honeysuckle, Amur privet, Tatarian honeysuckle, eastern redcedar, arrowwood, American cranberrybush.	Austrian pine, osageorange, green ash.	Pin oak, eastern white pine.	---

See footnote at end of table.

TABLE 9.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of--				
	<8	8-15	16-25	26-35	>35
RuB------------ Russell	---	Amur honeysuckle, American cranberrybush, Amur privet, silky dogwood.	White fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
So------------ Sloan	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	Northern white-cedar, Norway spruce, Austrian pine, blue spruce, white fir, Washington hawthorn.	Eastern white pine	Pin oak.
Sr------------ Starks	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Austrian pine, white fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce-----	Eastern white pine, pin oak.
St------------ Stonelick	---	Tatarian honeysuckle, Siberian peashrub.	Green ash, eastern redcedar, osageorange, northern white-cedar, nannyberry viburnum, white spruce, Washington hawthorn.	Black willow------	---
Ud*: Udorthents.					
Pits.					
WmB------------ Williamstown	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	White fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
XnA, XnB---------- Xenia	---	Amur honeysuckle, American cranberrybush, Amur privet, silky dogwood.	White fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 10.--RECREATIONAL DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
AvA, AvB: Avonburg	Severe: wetness, percs slowly.	Severe: percs slowly.	Severe: wetness, percs slowly.	Moderate: wetness.	Moderate: wetness.
Cg: Chagrin	Severe: flooding.	Moderate: flooding.	Severe: flooding.	Moderate: flooding.	Severe: flooding.
Ch: Chagrin Variant	Severe: flooding.	Moderate: flooding.	Severe: flooding.	Moderate: flooding.	Severe: flooding.
CkB2: Cincinnati	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Slight	Slight.
CkC2, CkC3: Cincinnati	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
Cm: Clermont	Severe: ponding, percs slowly.	Severe: ponding, percs slowly.	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding.
CnG*:					
Corydon	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Moderate: slope.	Severe: slope, thin layer.
Rock outcrop.					
CrA: Crosby	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
Cy: Cyclone	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
FcA, FcB: Fincastle	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
FoA: Fox	Slight	Slight	Moderate: small stones.	Slight	Slight.
FoB: Fox	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.
GfD: Grayford	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
GrC2*:					
Grayford	Slight	Slight	Severe: slope.	Slight	Slight.
Ryker	Slight	Slight	Severe: slope.	Slight	Slight.
HeG: Hennepin	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.

See footnote at end of table.

TABLE 10.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
HkD2: Hickory	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
HkE2, HkF: Hickory	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
HlD3: Hickory	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
Lb: Lobdell	Severe: flooding.	Moderate: flooding, wetness.	Severe: flooding.	Moderate: flooding.	Severe: flooding.
MeA: Martinsville	Slight	Slight	Slight	Slight	Slight.
MeB2: Martinsville	Slight	Slight	Moderate: slope.	Slight	Slight.
MmB2: Miami	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Slight	Slight.
MmC2: Miami	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Slight	Moderate: slope.
MmD2: Miami	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
MoC3: Miami	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Slight	Moderate: slope.
MoD3: Miami	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Mr: Milford	Severe: ponding, too clayey.	Severe: ponding, too clayey.	Severe: too clayey, ponding.	Severe: ponding, too clayey.	Severe: ponding, too clayey.
Ms: Millsdale	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
MtA: Milton	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: percs slowly.	Slight	Moderate: thin layer.
MtB2: Milton	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, depth to rock, percs slowly.	Slight	Moderate: thin layer.
My: Montgomery	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
OcA: Ockley	Slight	Slight	Slight	Slight	Slight.
OcB: Ockley	Slight	Slight	Moderate: slope.	Slight	Slight.

See footnote at end of table.

TABLE 10.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
Or: Orrville	Severe: flooding, wetness.	Moderate: flooding, wetness.	Severe: wetness, flooding.	Moderate: wetness, flooding.	Severe: flooding.
RoG: Rodman	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: droughty, slope.
RsB2: Rossmoyne	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Moderate: wetness.	Moderate: wetness.
RuB: Russell	Slight	Slight	Moderate: slope.	Slight	Slight.
So: Sloan	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness, flooding.	Severe: wetness.	Severe: wetness, flooding.
Sr: Starks	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
St: Stonelick	Severe: flooding.	Moderate: flooding, small stones.	Severe: small stones, flooding.	Moderate: flooding.	Severe: flooding.
Ud*: Udorthents.					
Pits.					
WmB: Williamstown	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Moderate: wetness.	Moderate: wetness.
XnA: Xenia	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: wetness.	Slight.
XnB: Xenia	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Moderate: wetness.	Slight.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 11.--WILDLIFE HABITAT POTENTIALS

[See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
AvA: Avonburg	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
AvB: Avonburg	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Cg: Chagrin	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Ch: Chagrin Variant	Poor	Fair	Fair	Good	Good	Poor	Poor	Fair	Good	Poor.
CkB2: Cincinnati	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
CkC2, CkC3: Cincinnati	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Cm: Clermont	Poor	Fair	Good	Fair	Fair	Good	Good	Fair	Fair	Good.
CnG*:										
Corydon	Poor	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
Rock outcrop.										
CrA: Crosby	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Cy: Cyclone	Fair	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
FcA: Fincastle	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
FcB: Fincastle	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
FoA, FoB: Fox	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
GfD: Grayford	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
GrC2*:										
Grayford	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Ryker	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
HeG: Hennepin	Very poor.	Poor	Good	Good	Fair	Very poor.	Very poor.	Poor	Good	Very poor.
HkD2: Hickory	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
HkE2: Hickory	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.

See footnote at end of table.

TABLE 11.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife
HkF-----------------Hickory	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
HlD3----------------Hickory	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Lb------------------Lobdell	Poor	Fair	Fair	Good	Good	Poor	Poor	Fair	Good	Poor.
MeA, MeB2-----------Martinsville	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
MmB2----------------Miami	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
MmC2----------------Miami	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
MmD2----------------Miami	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
MoC3----------------Miami	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
MoD3----------------Miami	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Mr------------------Milford	Good	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
Ms------------------Millsdale	Fair	Fair	Fair	Fair	Poor	Good	Fair	Fair	Fair	Fair.
MtA, MtB2-----------Milton	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
My------------------Montgomery	Fair	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
OcA, OcB------------Ockley	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Or------------------Orrville	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
RoG-----------------Rodman	Very poor.	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
RsB2----------------Rossmoyne	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
RuB-----------------Russell	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
So------------------Sloan	Fair	Fair	Good	Poor	Poor	Good	Good	Fair	Poor	Good.
Sr------------------Starks	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
St------------------Stonelick	Poor	Fair	Fair	Fair	Fair	Poor	Very poor.	Fair	Fair	Very poor.
Ud*: Udorthents.										

See footnote at end of table.

TABLE 11.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
Ud*: Pits.										
WmB----------------- Williamstown	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
XnA, XnB------------ Xenia	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 12.--BUILDING SITE DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
AvA, AvB: Avonburg	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
Cg: Chagrin	Moderate: wetness, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.
Ch: Chagrin Variant	Severe: depth to rock.	Severe: flooding.	Severe: flooding, depth to rock.	Severe: flooding.	Severe: flooding.	Severe: flooding.
CkB2: Cincinnati	Moderate: dense layer, wetness.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: slope, shrink-swell.	Severe: low strength, frost action.	Slight.
CkC2, CkC3: Cincinnati	Moderate: dense layer, wetness, slope.	Moderate: slope, shrink-swell.	Moderate: wetness, slope, shrink-swell.	Severe: slope.	Severe: low strength, frost action.	Moderate: slope.
Cm: Clermont	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: ponding.
CnG*:						
Corydon	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, low strength, slope.	Severe: slope, thin layer.
Rock outcrop.						
CrA: Crosby	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
Cy: Cyclone	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: ponding.
FcA, FcB: Fincastle	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
FoA: Fox	Severe: cutbanks cave.	Moderate: shrink-swell.	Slight	Moderate: shrink-swell.	Moderate: frost action, shrink-swell.	Slight.
FoB: Fox	Severe: cutbanks cave.	Moderate: shrink-swell.	Slight	Moderate: shrink-swell, slope.	Moderate: frost action, shrink-swell.	Slight.
GfD: Grayford	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, frost action.	Severe: slope.
GrC2*:						
Grayford	Moderate: depth to rock, too clayey.	Moderate: shrink-swell.	Moderate: depth to rock, shrink-swell.	Moderate: shrink-swell, slope.	Severe: frost action.	Slight.
Ryker	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.	Slight.

See footnote at end of table.

TABLE 12.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
HeG---------------- Hennepin	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
HkD2--------------- Hickory	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: slope.
HkE2, HkF---------- Hickory	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
HlD3--------------- Hickory	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: slope.
Lb----------------- Lobdell	Severe: wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: flooding, frost action.	Severe: flooding.
MeA---------------- Martinsville	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: low strength, frost action.	Slight.
MeB2--------------- Martinsville	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: low strength, frost action.	Slight.
MmB2--------------- Miami	Slight----------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: slope, shrink-swell.	Moderate: frost action, low strength.	Slight.
MmC2--------------- Miami	Moderate: slope.	Moderate: slope, shrink-swell.	Moderate: slope, shrink-swell.	Severe: slope.	Moderate: slope, frost action, low strength.	Moderate: slope.
MmD2--------------- Miami	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
MoC3--------------- Miami	Moderate: slope.	Moderate: slope, shrink-swell.	Moderate: slope, shrink-swell.	Severe: slope.	Moderate: slope, frost action, low strength.	Moderate: slope.
MoD3--------------- Miami	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Mr----------------- Milford	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: ponding, too clayey.
Ms----------------- Millsdale	Severe: depth to rock, ponding.	Severe: ponding, shrink-swell.	Severe: ponding, depth to rock, shrink-swell.	Severe: ponding, shrink-swell.	Severe: low strength, ponding, frost action.	Severe: ponding.
MtA---------------- Milton	Severe: depth to rock.	Moderate: shrink-swell, depth to rock.	Severe: depth to rock.	Moderate: shrink-swell, depth to rock.	Severe: low strength.	Moderate: thin layer.
MtB2--------------- Milton	Severe: depth to rock.	Moderate: shrink-swell, depth to rock.	Severe: depth to rock.	Moderate: shrink-swell, slope, depth to rock.	Severe: low strength.	Moderate: thin layer.
My----------------- Montgomery	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: low strength, ponding, frost action.	Severe: ponding.

See footnote at end of table.

TABLE 12.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
OcA----------------- Ockley	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
OcB----------------- Ockley	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.
Or------------------ Orrville	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, frost action.	Severe: flooding.
RoG----------------- Rodman	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: droughty, slope.
RsB2---------------- Rossmoyne	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell, slope.	Severe: low strength, frost action.	Moderate: wetness.
RuB----------------- Russell	Slight----------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.	Slight.
So------------------ Sloan	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, wetness, flooding.	Severe: wetness, flooding.
Sr------------------ Starks	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
St------------------ Stonelick	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.
Ud*: Udorthents.						
Pits.						
WmB----------------- Williamstown	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell, slope.	Severe: low strength, frost action.	Moderate: wetness.
XnA----------------- Xenia	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: low strength, frost action.	Slight.
XnB----------------- Xenia	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell, slope.	Severe: low strength, frost action.	Slight.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 13.--SANITARY FACILITIES

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
AvA: Avonburg	Severe: wetness, percs slowly.	Slight	Severe: wetness.	Severe: wetness.	Poor: wetness.
AvB: Avonburg	Severe: wetness, percs slowly.	Moderate: slope.	Severe: wetness.	Severe: wetness.	Poor: wetness.
Cg: Chagrin	Severe: flooding.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Good.
Ch: Chagrin Variant	Severe: flooding, depth to rock.	Severe: depth to rock, flooding.	Severe: flooding, depth to rock.	Severe: flooding, depth to rock.	Poor: area reclaim.
CkB2: Cincinnati	Severe: percs slowly.	Moderate: seepage, slope, wetness.	Moderate: too clayey.	Slight	Fair: too clayey.
CkC2, CkC3: Cincinnati	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
Cm: Clermont	Severe: ponding, percs slowly.	Slight	Severe: ponding.	Severe: ponding.	Poor: ponding.
CnG*:					
Corydon	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim.
Rock outcrop.					
CrA: Crosby	Severe: wetness, percs slowly.	Slight	Severe: wetness.	Severe: wetness.	Poor: wetness.
Cy: Cyclone	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.
FcA, FcB: Fincastle	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: hard to pack, wetness.
FoA, FoB: Fox	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
GfD: Grayford	Severe: slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Poor: slope.
GrC2*:					
Grayford	Moderate: depth to rock, percs slowly.	Severe: slope.	Severe: depth to rock.	Moderate: depth to rock.	Fair: area reclaim, too clayey.

See footnote at end of table.

TABLE 13.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
GrC2*:					
Ryker	Moderate: perсs slowly.	Severe: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
HeG Hennepin	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
HkD2 Hickory	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
HkE2, HkF Hickory	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
HlD3 Hickory	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
Lb Lobdell	Severe: flooding, wetness.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Fair: wetness.
MeA Martinsville	Slight	Moderate: seepage.	Moderate: too clayey.	Slight	Fair: too clayey, thin layer.
MeB2 Martinsville	Slight	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey, thin layer.
MmB2 Miami	Severe: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey.
MmC2 Miami	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
MmD2 Miami	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
MoC3 Miami	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
MoD3 Miami	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Mr Milford	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding, too clayey.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.
Ms Millsdale	Severe: depth to rock, ponding, percs slowly.	Severe: depth to rock, ponding.	Severe: depth to rock, ponding, too clayey.	Severe: depth to rock, ponding.	Poor: too clayey, area reclaim, hard to pack.
MtA, MtB2 Milton	Severe: depth to rock, percs slowly.	Severe: depth to rock.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: area reclaim, too clayey.

See footnote at end of table.

TABLE 13.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
My----------------- Montgomery	Severe: ponding, percs slowly.	Severe: seepage, ponding.	Severe: seepage, ponding, too clayey.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.
OcA, OcB----------- Ockley	Slight-----------	Severe: seepage.	Severe: seepage.	Slight-----------	Poor: small stones.
Or----------------- Orrville	Severe: flooding, wetness.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, wetness.	Poor: wetness.
RoG---------------- Rodman	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, small stones.
RsB2--------------- Rossmoyne	Severe: wetness, percs slowly.	Moderate: slope.	Severe: wetness.	Moderate: wetness.	Fair: too clayey, wetness.
RuB---------------- Russell	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight-----------	Fair: too clayey.
So----------------- Sloan	Severe: flooding, wetness, percs slowly.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
Sr----------------- Starks	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: wetness.	Poor: wetness.
St----------------- Stonelick	Severe: flooding.	Severe: seepage, flooding.	Severe: flooding, seepage.	Severe: flooding, seepage.	Poor: seepage.
Ud*: Udorthents.					
Pits.					
WmB---------------- Williamstown	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Moderate: wetness.	Fair: too clayey, wetness.
XnA, XnB----------- Xenia	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 14.--CONSTRUCTION MATERIALS

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," "poor," "probable," and "improbable." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
AvA, AvB: Avonburg	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim.
Cg: Chagrin	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Ch: Chagrin Variant	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, small stones, thin layer.
CkB2: Cincinnati	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, small stones.
CkC2, CkC3: Cincinnati	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, small stones, slope.
Cm: Clermont	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
CnG*:				
Corydon	Poor: area reclaim, low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, slope.
Rock outcrop.				
CrA: Crosby	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, small stones.
Cy: Cyclone	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
FcA, FcB: Fincastle	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
FoA, FoB: Fox	Good	Probable	Probable	Poor: small stones, area reclaim.
GfD: Grayford	Poor: thin layer.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
GrC2*:				
Grayford	Poor: thin layer.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, area reclaim.
Ryker	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
HeG: Hennepin	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
HkD2: Hickory	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.

See footnote at end of table.

TABLE 14.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
HkE2: Hickory	Fair: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
HkF: Hickory	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
HlD3: Hickory	Fair: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Lb: Lobdell	Fair: wetness, low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
MeA, MeB2: Martinsville	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
MmB2: Miami	Fair: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim.
MmC2: Miami	Fair: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, slope.
MmD2: Miami	Fair: slope, low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
MoC3: Miami	Fair: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, slope.
MoD3: Miami	Fair: slope, low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Mr: Milford	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
Ms: Millsdale	Poor: low strength, area reclaim, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness, thin layer.
MtA, MtB2: Milton	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
My: Montgomery	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, wetness.
OcA, OcB: Ockley	Good	Probable	Probable	Poor: small stones, area reclaim.
Or: Orrville	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.

See footnote at end of table.

TABLE 14.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
RoG: Rodman	Poor: slope.	Probable	Probable	Poor: small stones, area reclaim, slope.
RsB2: Rossmoyne	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim.
RuB: Russell	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
So: Sloan	Poor: wetness, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Sr: Starks	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
St: Stonelick	Good	Probable	Improbable: too sandy.	Poor: small stones.
Ud*: Udorthents.				
Pits.				
WmB: Williamstown	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
XnA, XnB: Xenia	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 15.--WATER MANAGEMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not evaluated]

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Terraces and diversions	Grassed waterways
AvA: Avonburg	Moderate: seepage.	Moderate: piping, wetness.	Severe: no water.	Percs slowly, frost action.	Erodes easily, wetness, rooting depth.	Wetness, erodes easily, rooting depth.
AvB: Avonburg	Moderate: seepage, slope.	Moderate: piping, wetness.	Severe: no water.	Percs slowly, frost action, slope.	Erodes easily, wetness, rooting depth.	Wetness, erodes easily, rooting depth.
Cg: Chagrin	Moderate: seepage.	Severe: piping.	Moderate: depth to water slow refill.	Deep to water	Favorable	Favorable.
Ch: Chagrin Variant	Moderate: seepage, depth to rock.	Severe: piping.	Severe: no water.	Deep to water	Depth to rock, erodes easily.	Erodes easily, depth to rock.
CkB2: Cincinnati	Moderate: seepage, slope.	Moderate: piping.	Severe: no water.	Deep to water	Erodes easily, rooting depth.	Erodes easily, rooting depth.
CkC2, CkC3: Cincinnati	Severe: slope.	Moderate: piping.	Severe: no water.	Deep to water	Slope, erodes easily, rooting depth.	Slope, erodes easily, rooting depth.
Cm: Clermont	Slight	Severe: ponding.	Severe: slow refill.	Ponding, percs slowly, frost action.	Erodes easily, ponding, percs slowly.	Wetness, erodes easily, percs slowly.
CnG*: Corydon	Severe: depth to rock, slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, depth to rock.	Slope, depth to rock.
Rock outcrop.						
CrA: Crosby	Slight	Severe: piping, wetness.	Severe: slow refill.	Percs slowly, frost action.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, rooting depth.
Cy: Cyclone	Moderate: seepage.	Severe: ponding.	Severe: slow refill.	Ponding, frost action.	Ponding	Wetness.
FcA: Fincastle	Moderate: seepage.	Severe: wetness.	Severe: slow refill.	Frost action	Erodes easily, wetness.	Wetness, erodes easily.
FcB: Fincastle	Moderate: seepage, slope.	Severe: wetness.	Severe: slow refill.	Frost action, slope.	Erodes easily, wetness.	Wetness, erodes easily.
FoA, FoB: Fox	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Too sandy	Rooting depth.
GfD: Grayford	Severe: slope.	Moderate: thin layer, piping.	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily.
GrC2*: Grayford	Moderate: seepage, depth to rock, slope.	Moderate: thin layer, piping.	Severe: no water.	Deep to water	Erodes easily	Erodes easily.
Ryker	Moderate: seepage, slope.	Slight	Severe: no water.	Deep to water	Erodes easily	Erodes easily.

See footnote at end of table.

TABLE 15.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Terraces and diversions	Grassed waterways
HeG---------------- Hennepin	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, percs slowly.	Slope, droughty, percs slowly.
HkD2, HkE2, HkF, HlD3-------------- Hickory	Severe: slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily.
Lb----------------- Lobdell	Severe: seepage.	Severe: piping.	Moderate: deep to water, slow refill.	Flooding, frost action.	Erodes easily, wetness.	Erodes easily.
MeA---------------- Martinsville	Moderate: seepage.	Severe: thin layer.	Severe: no water.	Deep to water	Erodes easily	Erodes easily.
MeB2--------------- Martinsville	Moderate: seepage, slope.	Severe: thin layer.	Severe: no water.	Deep to water	Erodes easily	Erodes easily.
MmB2--------------- Miami	Moderate: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Erodes easily	Erodes easily.
MmC2, MmD2, MoC3, MoD3-------------- Miami	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily.
Mr----------------- Milford	Slight----------	Severe: ponding.	Severe: slow refill.	Ponding, frost action.	Erodes easily, ponding.	Wetness, erodes easily.
Ms----------------- Millsdale	Moderate: depth to rock.	Severe: ponding.	Severe: no water.	Depth to rock, frost action, ponding.	Depth to rock, ponding.	Wetness, depth to rock.
MtA---------------- Milton	Moderate: seepage, depth to rock.	Severe: thin layer.	Severe: no water.	Deep to water	Depth to rock, erodes easily.	Erodes easily, depth to rock.
MtB2--------------- Milton	Moderate: seepage, depth to rock, slope.	Severe: thin layer.	Severe: no water.	Deep to water	Depth to rock, erodes easily.	Erodes easily, depth to rock.
My----------------- Montgomery	Moderate: seepage.	Severe: hard to pack, ponding.	Severe: slow refill.	Ponding, percs slowly, frost action.	Ponding, percs slowly.	Wetness, percs slowly.
OcA---------------- Ockley	Moderate: seepage.	Moderate: thin layer.	Severe: no water.	Deep to water	Erodes easily	Erodes easily.
OcB---------------- Ockley	Moderate: seepage, slope.	Moderate: thin layer.	Severe: no water.	Deep to water	Erodes easily	Erodes easily.
Or----------------- Orrville	Moderate: seepage.	Severe: piping, wetness.	Severe: cutbanks cave.	Flooding, frost action.	Erodes easily, wetness.	Wetness, erodes easily.
RoG---------------- Rodman	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Slope, too sandy.	Slope, droughty.
RsB2--------------- Rossmoyne	Moderate: seepage, slope.	Moderate: piping, wetness.	Severe: no water.	Percs slowly, frost action, slope.	Erodes easily, wetness.	Erodes easily, rooting depth.
RuB---------------- Russell	Moderate: seepage, slope.	Moderate: thin layer.	Severe: no water.	Deep to water	Erodes easily	Erodes easily.

See footnote at end of table.

TABLE 15.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Terraces and diversions	Grassed waterways
So---------------- Sloan	Moderate: seepage.	Severe: piping, wetness.	Severe: slow refill.	Flooding, frost action.	Erodes easily, wetness.	Wetness, erodes easily.
Sr---------------- Starks	Moderate: seepage.	Severe: thin layer, wetness.	Severe: slow refill, cutbanks cave.	Frost action----	Erodes easily, wetness.	Wetness, erodes easily.
St---------------- Stonelick	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Too sandy, soil blowing.	Droughty.
Ud*: Udorthents.						
Pits.						
WmB--------------- Williamstown	Moderate: seepage, slope.	Severe: thin layer.	Severe: no water.	Frost action, slope.	Erodes easily, wetness.	Erodes easily.
XnA--------------- Xenia	Moderate: seepage.	Moderate: thin layer, wetness.	Severe: slow refill.	Frost action----	Erodes easily, wetness.	Erodes easily.
XnB--------------- Xenia	Moderate: seepage, slope.	Moderate: thin layer, wetness.	Severe: slow refill.	Frost action, slope.	Erodes easily, wetness.	Erodes easily.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 16.--ENGINEERING INDEX PROPERTIES

[The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated]

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
AvA, AvB---------- Avonburg	0-13	Silt loam--------	CL, ML, CL-ML	A-4	0	100	100	95-100	75-95	20-30	2-10
	13-27	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	95-100	75-95	30-45	10-20
	27-76	Silty clay loam, silt loam.	CL	A-6, A-7	0-3	95-100	95-100	90-100	70-95	30-45	10-20
	76-80	Clay loam, loam, silt loam.	CL	A-6, A-7	0-3	95-100	90-100	75-95	60-85	30-45	10-20
Cg--------------- Chagrin	0-8	Loam------------	ML, CL, CL-ML	A-4	0	95-100	85-100	80-100	70-90	20-35	2-10
	8-60	Silt loam, loam, sandy loam.	ML, SM	A-4, A-2, A-6	0	90-100	75-100	55-90	30-80	20-40	NP-14
Ch--------------- Chagrin Variant	0-7	Silt loam--------	CL, CL-ML	A-4	0	95-100	90-100	80-100	60-90	20-30	5-10
	7-25	Silt loam, loam	CL, CL-ML	A-4, A-6	0	95-100	90-100	80-100	60-90	20-30	7-12
	25	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
CkB2, CkC2-------- Cincinnati	0-8	Silt loam--------	ML, CL	A-4, A-6	0	100	100	90-100	80-100	25-40	3-16
	8-26	Silty clay loam, silt loam.	CL	A-6, A-4	0	95-100	90-100	90-100	70-100	26-40	8-15
	26-60	Clay loam, loam, silty clay loam.	CL, CL-ML	A-6, A-4	0	95-100	85-100	75-95	65-85	25-40	6-20
	60-80	Clay loam, loam.	CL, ML, CL-ML	A-6, A-4	0	95-100	85-100	75-95	65-95	25-40	5-20
CkC3------------- Cincinnati	0-4	Silt loam--------	ML, CL	A-4, A-6	0	100	100	90-100	80-100	25-40	3-16
	4-16	Silty clay loam, silt loam.	CL	A-6, A-4	0	95-100	90-100	90-100	70-100	26-40	8-15
	16-60	Clay loam, loam, silty clay loam.	CL, CL-ML	A-6, A-4	0	95-100	85-100	75-95	65-85	25-40	6-20
	60-80	Clay loam, loam	CL, ML, CL-ML	A-6, A-4	0	95-100	85-100	75-95	65-95	25-40	5-20
Cm--------------- Clermont	0-19	Silt loam--------	CL, CL-ML, ML	A-4, A-6	0	95-100	95-100	85-95	75-90	22-40	3-18
	19-43	Silty clay loam, silt loam.	CL	A-6, A-7	0	95-100	95-100	90-100	85-95	30-45	12-25
	43-80	Silt loam, silty clay loam.	CL	A-6, A-7	0	95-100	85-100	75-95	65-90	32-48	12-28
CnG*:											
Corydon----------	0-3	Silt loam--------	CL, CL-ML	A-4, A-6	0-5	80-95	80-95	75-90	55-85	16-24	5-15
	3-15	Silt loam, loam	CL, ML-CL	A-6, A-4	0-5	80-95	80-95	75-90	55-85	16-28	5-15
	15	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop.											
CrA-------------- Crosby	0-10	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	95-100	80-100	50-90	22-34	6-15
	10-27	Clay loam, silty clay loam.	CL, CH	A-6, A-7	0-3	92-99	89-97	78-93	64-76	37-55	17-31
	27-60	Loam, clay loam, sandy loam.	CL, ML, CL-ML	A-4, A-6	0-3	88-94	83-89	74-87	50-64	17-30	2-14
Cy--------------- Cyclone	0-16	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	95-100	80-95	25-40	5-15
	16-46	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	85-95	30-50	15-30
	46-60	Loam, silt loam	CL, CL-ML	A-4, A-6	0	95-100	85-100	80-95	50-80	25-40	4-15
	60-65	Loam, clay loam, sandy loam.	CL-ML, CL	A-4, A-6	0	90-100	85-100	75-95	50-75	20-30	6-15

See footnote at end of table.

TABLE 16.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
FcA, FcB---------- Fincastle	0-10	Silt loam--------	CL, ML	A-4, A-6	0	100	95-100	90-100	75-93	27-36	4-12
	10-27	Silty clay loam, silt loam.	CL, CH	A-6, A-7	0	100	100	95-100	85-95	38-54	20-32
	27-54	Clay loam, loam	CH, CL	A-7	0	95-100	90-98	85-95	75-85	45-58	30-38
	54-60	Loam, fine sandy loam.	CL, ML, CL-ML	A-4, A-6	0-3	88-96	82-90	70-86	50-66	20-35	3-12
FoA, FoB---------- Fox	0-10	Loam--------------	ML, CL, CL-ML	A-4	0	95-100	85-100	75-95	55-90	20-30	3-10
	10-30	Clay loam, loam, sandy clay loam.	CL, SC	A-2, A-6, A-7	0-5	85-100	70-95	50-95	20-65	25-45	10-25
	30-60	Stratified sand to gravel.	SP, SM, GP, GM	A-1, A-2, A-3	0-10	40-100	35-100	15-95	2-20	---	NP
GfD--------------- Grayford	0-7	Silt loam--------	CL-ML, CL	A-4	0	100	100	90-100	70-90	18-30	4-10
	7-40	Clay loam, silty clay loam, loam.	CL	A-6, A-4	0-5	95-100	85-100	75-100	60-95	25-40	8-15
	40-48	Clay, silty clay, clay loam.	CH	A-7	0-10	95-100	65-95	60-90	50-85	45-55	15-25
	48	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
GrC2*: Grayford---------	0-7	Silt loam--------	CL-ML, CL	A-4	0	100	100	90-100	70-90	18-30	4-10
	7-36	Clay loam, silty clay loam, loam.	CL	A-6, A-4	0-5	95-100	85-100	75-100	60-95	25-40	8-15
	36-42	Clay, silty clay, clay loam.	CH	A-7	0-10	95-100	65-95	60-90	50-85	45-55	15-25
	42	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Ryker------------	0-7	Silt loam--------	CL-ML, CL	A-4, A-6	0	100	100	90-100	80-95	25-35	5-15
	7-30	Silt loam, silty clay loam.	CL	A-6, A-7	0	100	100	90-100	75-95	30-45	15-25
	30-59	Silt loam, silty clay loam, clay loam.	CL	A-6, A-7	0	85-98	80-98	75-95	60-85	30-45	15-25
	59-80	Loam, silty clay, clay, clay loam.	CL, CH	A-7	0	80-95	75-95	75-95	60-85	40-60	20-30
HeG--------------- Hennepin	0-3	Loam--------------	CL, CL-ML	A-4, A-6	0-5	90-100	85-100	70-100	60-95	25-40	5-20
	3-17	Loam--------------	SC, SM-SC, CL, CL-ML	A-4, A-6, A-7	0-5	85-100	80-100	65-100	35-95	20-50	5-25
	17-60	Loam, sandy loam	SC, SM-SC, CL, CL-ML	A-4, A-6, A-7	0-5	85-100	80-100	65-100	35-95	20-50	5-25
HkD2, HkE2, HkF-- Hickory	0-5	Loam--------------	CL	A-6, A-4	0-5	95-100	90-100	90-100	85-95	20-35	8-15
	5-52	Clay loam, silt loam, silty clay loam.	CL	A-6, A-7	0-5	100	90-100	80-95	75-90	30-50	15-30
	52-60	Clay loam, loam	CL-ML, CL	A-4, A-6	0-5	85-100	85-95	80-95	60-80	20-40	5-20
HlD3-------------- Hickory	0-4	Clay loam--------	CL	A-6, A-7	0-5	95-100	90-100	80-95	75-90	30-50	15-30
	4-48	Clay loam--------	CL	A-6, A-7	0-5	100	90-100	80-95	75-90	30-50	15-30
	48-60	Clay loam, loam.	CL-ML, CL	A-4, A-6	0-5	85-100	85-95	80-95	60-80	20-40	5-20
Lb---------------- Lobdell	0-8	Silt loam--------	ML, CL-ML, CL	A-4	0	95-100	90-100	80-100	65-90	20-30	NP-8
	8-60	Loam, silt loam, fine sandy loam.	ML	A-4	0	90-100	80-100	70-95	55-85	20-35	NP-10
MeA, MeB2--------- Martinsville	0-7	Loam--------------	CL, CL-ML	A-4, A-6	0	100	90-100	80-100	60-90	22-33	4-12
	7-44	Clay loam, silty clay loam, sandy clay loam, sandy loam.	CL, SC	A-4, A-6	0	100	90-100	65-90	40-90	20-35	8-20
	44-70	Sandy loam, sandy clay loam.	SM, ML	A-2-4, A-4	0	100	90-100	60-80	30-60	30-40	2-8
	70-75	Stratified sand to silt loam.	CL, SC, CL-ML, SM-SC	A-4	0	95-100	85-100	80-95	40-60	<25	4-9

See footnote at end of table.

TABLE 16.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
MmB2, MmC2, MmD2-- Miami	0-7	Silt loam--------	CL, CL-ML, ML	A-4	0	100	95-100	80-100	50-90	15-30	3-10
	7-30	Clay loam, silty clay loam.	CL, SC	A-6	0	90-100	85-100	70-95	40-95	30-40	15-25
	30-60	Loam, sandy loam	CL, CL-ML, ML, SC	A-4, A-6	0-3	85-95	90-100	70-90	45-70	20-30	5-11
MoC3, MoD3-------- Miami	0-6	Clay loam---------	CL	A-6	0	100	90-100	75-95	65-95	30-40	15-20
	6-26	Clay loam---------	CL, SC	A-6	0	90-100	85-100	70-95	40-95	30-40	15-25
	26-60	Loam, clay loam, sandy loam.	CL, CL-ML, ML, SC	A-4, A-6	0-3	85-95	90-100	70-90	45-70	20-30	5-11
Mr--------------- Milford	0-14	Silty clay--------	CL, CH	A-7	0	100	95-100	90-100	80-95	40-60	20-35
	14-47	Silty clay, silty clay loam.	CH, CL	A-7	0	100	95-100	90-100	75-100	40-60	20-40
	47-60	Stratified silty clay to loam.	CL	A-6, A-7	0	97-100	95-100	90-100	70-100	30-50	15-30
Ms--------------- Millsdale	0-9	Silty clay loam	CL	A-6, A-7	0	90-100	80-100	75-100	60-95	32-50	12-25
	9-36	Clay, silty clay loam, clay loam.	CH, CL	A-7	0-5	85-100	80-100	75-100	60-95	40-60	20-35
	36	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
MtA, MtB2--------- Milton	0-11	Silt loam--------	ML, CL	A-4, A-6	0	95-100	90-100	85-100	70-95	26-36	4-12
	11-24	Silty clay loam, clay loam, clay.	CL	A-6, A-7	0	95-100	80-100	75-100	70-95	32-48	12-28
	24-34	Clay, silty clay loam, silty clay	CH, CL	A-7, A-6	0-5	95-100	80-100	70-95	50-90	32-55	14-33
	34	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
My--------------- Montgomery	0-14	Silty clay--------	CL	A-7	0	100	100	100	85-98	40-50	20-28
	14-38	Silty clay, silty clay loam.	CH	A-7	0	100	100	95-100	90-98	55-65	34-42
	38-43	Silt loam, clay loam.	CL, SC	A-6	0-5	65-100	60-90	55-80	45-70	30-40	18-28
	43-60	Gravelly sandy loam, gravelly loam.	CL, GC, SC	A-2, A-4, A-6, A-7	0-10	55-85	50-80	40-75	25-55	30-45	8-20
OcA, OcB---------- Ockley	0-14	Silt loam--------	CL, ML, CL-ML	A-4, A-6	0	100	95-100	80-100	60-90	22-33	3-12
	14-26	Silt loam, loam, silty clay loam, clay loam.	CL	A-6, A-7	0	100	75-100	65-90	50-90	35-50	15-30
	26-45	Gravelly clay loam, gravelly loam, gravelly sandy clay loam.	CL, SC, GC	A-6, A-7	0-2	70-85	45-75	40-70	35-55	30-50	15-30
	45-60	Stratified sand to gravelly sand.	SP, SP-SM, GP, GP-GM	A-1	1-5	30-70	20-55	5-20	2-10	---	NP
Or--------------- Orrville	0-10	Silt loam---------	ML, CL-ML, CL	A-4	0	100	90-100	85-100	60-80	22-35	4-10
	10-40	Silt loam, loam, fine sandy loam.	CL, CL-ML, ML	A-4, A-6	0-2	95-100	75-100	70-95	45-90	20-40	2-16
	40-60	Silt loam, loam, fine sandy loam.	CL, CL-ML, ML	A-4, A-6	0-2	95-100	75-100	70-95	45-90	20-40	2-16

See footnote at end of table.

TABLE 16.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
RoG-------------- Rodman	0-8	Gravelly sandy loam.	SM-SC, SM	A-1, A-2, A-4	0-2	70-85	65-85	40-60	20-40	<25	NP-5
	8-13	Gravelly loam, sandy loam, loam.	ML, CL-ML, SM-SC, SM	A-4, A-2, A-1	0-2	70-85	60-85	40-75	20-55	<25	NP-5
	13-60	Stratified sand to gravelly sand.	SP, SP-SM, GP, GP-GM	A-1	1-5	30-70	22-55	7-20	2-10	---	NP
RsB2------------- Rossmoyne	0-7	Silt loam--------	ML	A-4	0	90-100	90-100	90-100	85-100	30-40	4-10
	7-21	Silty clay loam, silt loam.	CL, ML	A-6, A-7, A-4	0	90-100	90-100	85-100	75-95	30-48	8-20
	21-72	Silt loam, loam, silty clay loam.	CL	A-6, A-4	0	90-100	85-95	80-90	70-85	25-40	9-19
	72-80	Clay loam, loam	CL	A-6, A-7, A-4	0	80-95	70-90	65-85	60-80	25-42	8-20
RuB-------------- Russell	0-12	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	95-100	80-100	50-90	20-35	5-15
	12-30	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	95-100	85-95	35-50	20-35
	30-50	Clay loam, loam	CL	A-6, A-7	0	90-100	90-95	80-90	65-75	35-50	17-31
	50-60	Loam, fine sandy loam.	CL, ML, CL-ML	A-4, A-6	0-3	85-95	80-90	75-85	50-65	<30	2-14
So--------------- Sloan	0-13	Silt loam, silty clay loam.	CL, ML, CL-ML	A-6, A-4	0	100	95-100	85-100	70-95	20-40	3-15
	13-44	Silty clay loam, clay loam, silt loam, loam.	CL, ML	A-6, A-7, A-4	0	100	90-100	85-100	75-95	30-45	8-18
	44-60	Stratified gravelly sandy loam to silty clay loam.	ML, CL	A-4, A-6	0	95-100	70-100	60-95	50-90	25-40	3-15
Sr--------------- Starks	0-13	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	95-100	85-100	22-35	5-15
	13-25	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	90-100	80-100	35-45	15-24
	25-56	Sandy loam, loam, silty clay loam, clay loam.	CL, SC, CL-ML, SM-SC	A-4, A-6	0	95-100	90-100	80-95	40-80	25-40	6-17
	56-80	Stratified loamy sand to silt loam.	SM, SC, ML, CL	A-2, A-4, A-6	0-5	90-100	80-95	40-90	30-60	<30	NP-15
St--------------- Stonelick	0-40	Fine sandy loam, loam, sandy loam.	SM, ML, SM-SC, CL-ML	A-4, A-2	0	85-100	70-100	45-75	25-55	<24	NP-6
	40-60	Stratified loam to loamy sand.	SM, SP-SM	A-2, A-4, A-3, A-1-b	0	85-100	70-95	40-60	5-40	<15	NP
Ud*: Udorthents.											
Pits.											
WmB-------------- Williamstown	0-9	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-90	20-35	4-15
	9-33	Clay loam, silty clay loam.	CL	A-4, A-6	0	100	95-100	85-100	70-95	30-40	10-20
	33-37	Loam, clay loam	CL, CL-ML	A-6, A-4	0	100	95-100	80-95	60-80	20-35	5-15
	37-60	Loam-------------	ML, CL-ML, CL	A-4, A-6	0-2	100	95-100	80-95	55-75	20-35	3-11
XnA, XnB--------- Xenia	0-12	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-100	25-35	5-15
	12-29	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	90-100	80-95	35-50	15-30
	29-46	Clay loam--------	CL	A-6, A-7	0-5	92-100	90-95	75-95	65-75	35-50	15-30
	46-60	Loam-------------	CL, ML	A-4, A-6	0-5	85-95	80-90	75-90	40-65	15-30	NP-15

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 17.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS

[The symbol < means less than; > means more than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Organic matter" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated]

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	G/cm3	In/hr	In/in	pH					Pct
AvA, AvB: Avonburg	0-13	10-18	1.30-1.45	0.6-2.0	0.20-0.24	4.5-7.3	Low	0.43	4	5	.5-2
	13-27	22-30	1.35-1.50	0.6-2.0	0.18-0.20	4.5-5.5	Moderate	0.43			
	27-76	22-30	1.60-1.85	<0.06	0.06-0.08	4.5-6.5	Moderate	0.43			
	76-80	14-30	1.50-1.70	<0.06	0.06-0.10	4.5-8.4	Moderate	0.43			
Cg: Chagrin	0-8	10-27	1.20-1.40	0.6-2.0	0.20-0.24	5.6-7.3	Low	0.32	5	5	2-4
	8-60	18-30	1.20-1.50	0.6-2.0	0.14-0.20	5.6-7.3	Low	0.32			
Ch: Chagrin Variant	0-7	15-22	1.30-1.45	0.6-2.0	0.20-0.22	6.1-7.3	Low	0.37	4	5	1-4
	7-25	18-25	1.30-1.45	0.6-2.0	0.17-0.19	6.1-7.3	Low	0.37			
	25	---	---	---	---	---	---	---			
CkB2, CkC2: Cincinnati	0-8	15-25	1.30-1.50	0.6-2.0	0.22-0.24	4.5-7.3	Low	0.37	4-3	6	1-3
	8-26	22-35	1.45-1.65	0.6-2.0	0.15-0.19	4.5-5.5	Low	0.37			
	26-60	24-43	1.60-1.85	0.06-0.6	0.08-0.12	4.5-6.5	Moderate	0.37			
	60-80	24-40	1.55-1.75	0.06-0.6	0.08-0.12	4.5-6.5	Moderate	0.37			
CkC3: Cincinnati	0-4	15-27	1.30-1.50	0.6-2.0	0.22-0.24	4.5-7.3	Low	0.37	4-3	6	1-3
	4-16	22-35	1.45-1.65	0.6-2.0	0.15-0.19	4.5-5.5	Low	0.37			
	16-60	24-43	1.60-1.85	0.06-0.6	0.08-0.12	4.5-6.5	Moderate	0.37			
	60-80	24-40	1.55-1.75	0.06-0.6	0.08-0.12	4.5-6.5	Moderate	0.37			
Cm: Clermont	0-19	13-27	1.30-1.55	0.2-0.6	0.22-0.24	4.5-7.3	Low	0.37	5	6	1-3
	19-43	25-35	1.45-1.65	<0.06	0.18-0.22	4.5-5.5	Moderate	0.37			
	43-80	27-40	1.45-1.70	<0.06	0.10-0.18	5.1-7.3	Moderate	0.37			
CnG*: Corydon	0-3	10-18	1.30-1.45	0.6-2.0	0.20-0.22	5.6-7.8	Low	0.32	2	6	2-4
	3-15	10-23	1.30-1.55	0.6-2.0	0.11-0.20	5.6-7.8	Moderate	0.32			
	15	---	---	---	---	---	---	---			
Rock outcrop.											
CrA: Crosby	0-10	11-22	1.40-1.55	0.6-2.0	0.20-0.24	5.1-6.5	Low	0.43	3	5	1-3
	10-27	27-35	1.50-1.70	0.06-0.2	0.15-0.20	5.1-7.3	Moderate	0.43			
	27-60	15-32	1.70-2.00	0.06-0.6	0.05-0.19	7.4-8.4	Low	0.43			
Cy: Cyclone	0-16	18-27	1.30-1.50	0.6-2.0	0.23-0.25	6.1-7.3	Low	0.28	5	6	4-6
	16-46	27-35	1.40-1.60	0.6-2.0	0.18-0.20	6.1-7.3	Moderate	0.43			
	46-60	15-25	1.40-1.60	0.6-2.0	0.15-0.19	6.6-7.8	Low	0.43			
	60-65	15-25	1.50-1.80	0.2-0.6	0.05-0.19	7.4-8.4	Low	0.43			
FcA, FcB: Fincastle	0-10	11-22	1.40-1.55	0.6-2.0	0.22-0.24	5.1-6.5	Low	0.37	5	5	1-3
	10-27	20-35	1.45-1.65	0.2-0.6	0.18-0.20	5.1-7.3	Moderate	0.37			
	27-54	20-35	1.45-1.65	0.2-0.6	0.15-0.19	5.1-7.3	Moderate	0.37			
	54-60	13-30	1.55-1.90	0.06-2.0	0.05-0.19	7.4-8.4	Low	0.37			
FoA, FoB: Fox	0-10	10-17	1.35-1.55	0.6-2.0	0.20-0.24	5.1-7.3	Low	0.32	4	5	1-3
	10-30	25-35	1.55-1.65	0.6-2.0	0.15-0.19	5.6-8.4	Moderate	0.32			
	30-60	0-2	1.30-2.20	>6.0	0.02-0.04	7.4-8.4	Low	0.10			
GfD: Grayford	0-7	12-25	1.25-1.40	0.6-2.0	0.20-0.24	5.1-7.3	Low	0.37	5-4	5	.5-2
	7-40	20-35	1.40-1.60	0.6-2.0	0.16-0.20	4.5-5.5	Moderate	0.37			
	40-48	42-50	1.40-1.60	0.6-2.0	0.09-0.11	5.1-7.3	High	0.37			
	48	---	---	---	---	---	---	---			
GrC2*: Grayford	0-7	12-25	1.25-1.40	0.6-2.0	0.20-0.24	5.1-7.3	Low	0.37	5-4	5	.5-2
	7-36	20-35	1.40-1.60	0.6-2.0	0.16-0.20	4.5-5.5	Moderate	0.37			
	36-42	42-50	1.40-1.60	0.6-2.0	0.09-0.11	5.1-7.3	High	0.37			
	42	---	---	---	---	---	---	---			

See footnote at end of table.

TABLE 17.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	G/cm^3	In/hr	In/in	pH					Pct
GrC2*:											
Ryker	0-7	15-27	1.35-1.50	0.6-2.0	0.22-0.24	5.1-7.3	Low	0.37	5	5	1-4
	7-30	20-35	1.40-1.60	0.6-2.0	0.18-0.22	4.5-7.3	Moderate	0.37			
	30-59	20-35	1.45-1.65	0.6-2.0	0.15-0.20	4.5-6.0	Moderate	0.37			
	59-80	35-50	1.45-1.65	0.6-2.0	0.09-0.20	4.5-6.0	Moderate	0.37			
HeG Hennepin	0-3	20-30	1.20-1.40	0.6-2.0	0.18-0.24	6.1-7.8	Low	0.32	4	5	1-2
	3-17	18-30	1.30-1.60	0.2-2.0	0.14-0.22	6.1-7.8	Low	0.32			
	17-60	13-23	1.45-1.70	0.06-0.6	0.07-0.11	6.1-8.4	Low	0.32			
HkD2, HkE2, HkF Hickory	0-5	19-27	1.30-1.50	0.6-2.0	0.20-0.22	4.5-6.0	Low	0.37	5	6	1-2
	5-52	20-35	1.45-1.65	0.6-2.0	0.15-0.19	4.5-5.5	Moderate	0.37			
	52-60	15-32	1.50-1.70	0.6-2.0	0.11-0.19	5.1-8.4	Low	0.37			
HlD3 Hickory	0-4	27-35	1.40-1.65	0.6-2.0	0.17-0.19	4.5-6.0	Moderate	0.37	4	4	.5-1
	4-48	27-35	1.45-1.65	0.6-2.0	0.15-0.19	4.5-5.5	Moderate	0.37			
	48-60	15-32	1.50-1.70	0.6-2.0	0.11-0.19	5.1-8.4	Low	0.37			
Lb Lobdell	0-8	15-27	1.20-1.40	0.6-2.0	0.20-0.24	5.1-7.3	Low	0.37	5	5	1-3
	8-60	18-30	1.25-1.60	0.6-2.0	0.17-0.22	5.1-7.3	Low	0.37			
MeA, MeB2 Martinsville	0-7	8-17	1.30-1.45	0.6-2.0	0.20-0.24	5.6-7.3	Low	0.37	5	5	1-3
	7-44	18-30	1.40-1.60	0.6-2.0	0.17-0.20	5.1-6.0	Moderate	0.37			
	44-70	10-25	1.40-1.60	0.6-2.0	0.12-0.14	5.6-7.3	Low	0.24			
	70-75	3-23	1.50-1.70	0.6-2.0	0.19-0.21	7.4-8.4	Low	0.24			
MmB2, MmC2, MmD2 Miami	0-7	11-22	1.30-1.45	0.6-2.0	0.20-0.24	5.6-7.3	Low	0.37	5	5	.5-3
	7-30	25-35	1.45-1.65	0.6-2.0	0.15-0.20	5.1-7.3	Moderate	0.37			
	30-60	15-25	1.55-1.90	0.2-0.6	0.05-0.19	6.6-8.4	Moderate	0.37			
MoC3, MoD3 Miami	0-6	27-35	1.35-1.60	0.6-2.0	0.18-0.20	5.6-7.3	Moderate	0.37	4	6	.5-3
	6-26	25-35	1.45-1.65	0.6-2.0	0.15-0.20	5.1-7.3	Moderate	0.37			
	26-60	15-25	1.55-1.90	0.2-0.6	0.05-0.19	7.4-8.4	Moderate	0.37			
Mr Milford	0-14	35-42	1.30-1.50	0.6-2.0	0.12-0.23	5.6-7.3	High	0.28	5	4	5-6
	14-47	35-42	1.45-1.65	0.2-0.6	0.18-0.20	5.1-7.8	Moderate	0.43			
	47-60	20-30	1.50-1.70	0.2-0.6	0.20-0.22	7.4-8.4	Moderate	0.43			
Ms Millsdale	0-9	27-32	1.30-1.50	0.6-2.0	0.19-0.22	6.1-7.3	Moderate	0.32	4	6	4-7
	9-36	35-45	1.40-1.70	0.2-0.6	0.12-0.16	6.1-8.4	High	0.32			
	36	---	---	---	---	---	---	---			
MtA, MtB2 Milton	0-11	14-27	1.30-1.50	0.6-2.0	0.18-0.23	5.1-7.3	Low	0.37	4	6	1-3
	11-24	35-50	1.45-1.70	0.2-2.0	0.12-0.18	4.5-7.8	Moderate	0.37			
	24-34	25-50	1.40-1.70	0.2-2.0	0.12-0.16	5.1-,.8	Moderate	0.37			
	34	---	---	---	---	---	---	---			
My Montgomery	0-14	35-40	1.35-1.55	0.2-0.6	0.21-0.23	6.1-7.3	High	0.28	4	7	5-8
	14-38	40-55	1.45-1.65	0.06-0.2	0.11-0.13	6.6-7.8	High	0.28			
	38-43	30-40	1.50-1.70	0.2-2.0	0.09-0.15	7.4-7.8	Moderate	0.28			
	43-60	15-25	1.50-1.70	2.0-20	0.05-0.10	7.4-8.4	Low	0.28			
OcA, OcB Ockley	0-14	11-22	1.30-1.45	0.6-2.0	0.20-0.24	5.6-7.3	Low	0.37	5	5	.5-3
	14-26	27-35	1.45-1.60	0.6-2.0	0.15-0.20	4.5-7.3	Moderate	0.37			
	26-45	20-35	1.40-1.55	0.6-2.0	0.12-0.14	5.6-6.5	Moderate	0.24			
	45-60	2-5	1.60-1.80	>20	0.02-0.04	7.4-8.4	Low	0.10			
Or Orrville	0-10	12-27	1.25-1.45	0.6-2.0	0.18-0.22	5.1-7.3	Low	0.37	5	6	2-4
	10-40	12-27	1.30-1.50	0.6-2.0	0.15-0.19	5.1-6.5	Low	0.37			
	40-60	12-18	1.30-1.50	0.6-2.0	0.15-0.19	5.6-7.3	Low	0.37			
RoG Rodman	0-8	5-20	1.10-1.40	2.0-6.0	0.09-0.12	6.6-7.8	Low	0.15	3	8	---
	8-13	5-25	1.10-1.50	2.0-6.0	0.09-0.12	6.6-7.8	Low	0.20			
	13-60	0-10	>1.80	>20	0.02-0.04	7.4-8.4	Low	0.10			

See footnote at end of table.

TABLE 17.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	G/cm3	In/hr	In/in	pH					Pct
RsB2	0-7	13-27	1.35-1.50	0.6-2.0	0.20-0.24	4.5-7.3	Low	0.37	4	6	1-3
Rossmoyne	7-21	22-35	1.40-1.60	0.6-2.0	0.14-0.19	4.5-5.5	Moderate	0.37			
	21-72	24-35	1.70-1.90	0.06-0.6	0.06-0.10	4.5-5.5	Moderate	0.37			
	72-80	18-45	1.60-1.75	0.06-0.6	0.06-0.10	5.6-8.4	Moderate	0.37			
RuB	0-12	11-25	1.30-1.45	0.6-2.0	0.21-0.24	5.6-7.3	Low	0.37	5	5	.5-2
Russell	12-30	25-33	1.40-1.60	0.6-2.0	0.18-0.20	4.5-6.5	Moderate	0.37			
	30-50	23-33	1.40-1.60	0.6-2.0	0.15-0.19	5.6-7.3	Moderate	0.37			
	50-60	14-30	1.60-1.80	0.6-2.0	0.05-0.19	7.4-8.4	Low	0.37			
So	0-13	15-27	1.20-1.40	0.6-2.0	0.20-0.24	6.1-7.8	Low	0.37	5	6	3-6
Sloan	13-44	15-35	1.25-1.55	0.2-2.0	0.15-0.19	6.1-8.4	Moderate	0.37			
	44-60	10-30	1.20-1.50	0.2-2.0	0.13-0.18	6.6-8.4	Low	0.37			
Sr	0-13	15-27	1.15-1.35	0.6-2.0	0.22-0.24	5.6-7.3	Moderate	0.37	5	6	1-3
Starks	13-25	22-35	1.35-1.55	0.2-2.0	0.18-0.20	5.1-6.5	Moderate	0.37			
	25-56	20-30	1.45-1.65	0.2-2.0	0.16-0.19	5.1-7.3	Moderate	0.37			
	56-80	5-20	1.55-1.75	2.0-6.0	0.08-0.18	5.6-8.4	Low	0.37			
St	0-40	8-18	1.25-1.50	2.0-6.0	0.09-0.14	7.4-8.4	Low	0.24	5	3	.5-2
Stonelick	40-60	5-18	1.20-1.55	2.0-6.0	0.05-0.11	7.4-8.4	Low	0.24			
Ud*:											
Udorthents.											
Pits.											
WmB	0-9	14-26	1.30-1.45	0.6-2.0	0.22-0.24	5.6-7.3	Low	0.37	5	5	1-3
Williamstown	9-33	27-35	1.35-1.50	0.6-2.0	0.15-0.21	5.6-7.3	Moderate	0.37			
	33-37	18-27	1.35-1.50	0.6-2.0	0.15-0.19	6.1-7.8	Low	0.37			
	37-60	16-26	1.45-1.70	0.2-0.6	0.05-0.19	7.4-8.4	Low	0.37			
XnA, XnB	0-12	11-22	1.40-1.55	0.6-2.0	0.22-0.24	6.6-7.3	Low	0.37	5	5	1-3
Xenia	12-29	25-35	1.45-1.65	0.2-0.6	0.18-0.20	5.1-6.0	Moderate	0.37			
	29-46	27-35	1.45-1.65	0.2-0.6	0.15-0.19	5.1-7.3	Moderate	0.37			
	46-60	13-27	1.55-1.90	0.2-2.0	0.05-0.19	7.3-8.4	Low	0.37			

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 18.--SOIL AND WATER FEATURES

["Flooding" and "water table" and terms such as "brief," "apparent," and "perched" are explained in the text. The symbol > means more than. Absence of an entry indicates that the feature is not a concern]

Soil name and map symbol	Hydrologic group	Flooding: Frequency	Flooding: Duration	Flooding: Months	High water table: Depth	High water table: Kind	High water table: Months	Bedrock: Depth	Bedrock: Hardness	Potential frost action	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete
					Ft			In				
AvA, AvB----------- Avonburg	D	None---------	---	---	1.0-3.0	Perched	Jan-Apr	>60	---	High-----	High-----	High.
Cg----------------- Chagrin	B	Frequent----	Very brief	Nov-May	4.0-6.0	Apparent	Feb-Mar	>60	---	Moderate	Low------	Moderate.
Ch----------------- Chagrin Variant	B	Frequent----	Very brief	Nov-May	>6.0	---	---	20-40	---	Moderate	---	---
CkB2, CkC2, CkC3-- Cincinnati	C	None---------	---	---	>4.0	Perched	Jan-Apr	>60	---	High-----	Moderate	High.
Cm----------------- Clermont	D	None---------	---	---	+1-1.0	Apparent	Nov-May	>60	---	High-----	High-----	High.
CnG*:												
Corydon----------	D	None---------	---	---	>6.0	---	---	10-20	Hard	Moderate	Moderate	Low.
Rock outcrop.												
CrA---------------- Crosby	C	None---------	---	---	1.0-3.0	Apparent	Jan-Apr	>60	---	High-----	High-----	Moderate.
Cy----------------- Cyclone	B/D	None---------	---	---	+.5-1.0	Apparent	Dec-May	>60	---	High-----	High-----	Low.
FcA, FcB----------- Fincastle	C	None---------	---	---	1.0-3.0	Apparent	Jan-Apr	>60	---	High-----	High-----	Moderate.
FoA, FoB----------- Fox	B	None---------	---	---	>6.0	---	---	>60	---	Moderate	Low------	Moderate.
GfD---------------- Grayford	B	None---------	---	---	>6.0	---	---	40-60	Hard	High-----	High-----	Moderate.
GrC2*:												
Grayford---------	B	None---------	---	---	>6.0	---	---	40-60	Hard	High-----	High-----	Moderate.
Ryker------------	B	None---------	---	---	>6.0	---	---	>60	---	High-----	Moderate	Moderate.
HeG---------------- Hennepin	B	None---------	---	---	>6.0	---	---	>60	---	Moderate	Low------	Low.
HkD2, HkE2, HkF, HlD3-------------- Hickory	C	None---------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
Lb----------------- Lobdell	B	Frequent----	Very brief	Jan-Apr	2.0-3.5	Apparent	Dec-Apr	>60	---	High-----	Low------	Moderate.

See footnote at end of table.

TABLE 18.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
MeA, MeB2---------- Martinsville	B	None---------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
MmB2, MmC2, MmD2, MoC3, MoD3-------- Miami	B	None---------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
Mr----------------- Milford	B/D	None---------	---	---	+.5-2.0	Apparent	Mar-Jun	>60	---	High------	High------	Low.
Ms----------------- Millsdale	B/D	None---------	---	---	+1-1.0	Perched	Jan-Apr	20-40	Hard	High------	High------	Low.
MtA, MtB2---------- Milton	C	None---------	---	---	>6.0	---	---	20-40	Hard	Moderate	High------	Moderate.
My----------------- Montgomery	D	None---------	---	---	+1-1.0	Apparent	Dec-May	>60	---	High------	High------	Low.
OcA, OcB----------- Ockley	B	None---------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
Or----------------- Orrville	C	Frequent-----	Very brief	Nov-May	1.0-2.5	Apparent	Nov-Jun	>60	---	High------	High------	Moderate.
RoG---------------- Rodman	A	None---------	---	---	>6.0	---	---	>60	---	Low-------	Low-------	Low.
RsB2--------------- Rossmoyne	C	None---------	---	---	1.5-3.0	Perched	Jan-Apr	>60	---	High------	High------	High.
RuB---------------- Russell	B	None---------	---	---	>6.0	---	---	>60	---	High------	Moderate	Moderate.
So----------------- Sloan	B/D	Frequent-----	Brief------	Nov-Jun	0-1.0	Apparent	Nov-Jun	>60	---	High------	High------	Low.
Sr----------------- Starks	C	None---------	---	---	1.0-3.0	Apparent	Mar-Jun	>60	---	High------	High------	Moderate.
St----------------- Stonelick	B	Frequent-----	Very brief	Nov-Jun	>6.0	---	---	>60	---	Moderate	Low-------	Low.
Ud*: Udorthents.												
Pits.												
WmB---------------- Williamstown	C	None---------	---	---	1.5-3.5	Perched	Jan-Apr	>60	---	High------	Moderate	Low.
XnA, XnB----------- Xenia	B	None---------	---	---	2.0-6.0	Apparent	Mar-Apr	>60	---	High------	High------	Moderate.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 19.--CLASSIFICATION OF THE SOILS

[An asterisk in the first column indicates that the soil is a taxadjunct to the series. See text for a description of those characteristics of the soil that are outside the range of the series]

Soil name	Family or higher taxonomic class
*Avonburg	Fine-silty, mixed, mesic Aeric Fragiaqualfs
*Chagrin	Fine-loamy, mixed, mesic Dystric Fluventic Eutrochrepts
Chagrin Variant	Fine-loamy, mixed, mesic Dystric Fluventic Eutrochrepts
*Cincinnati	Fine-silty, mixed, mesic Typic Fragiudalfs
*Clermont	Fine-silty, mixed, mesic Typic Ochraqualfs
*Corydon	Clayey, mixed, mesic Lithic Argiudolls
*Crosby	Fine, mixed, mesic Aeric Ochraqualfs
Cyclone	Fine-silty, mixed, mesic Typic Argiaquolls
*Fincastle	Fine-silty, mixed, mesic Aeric Ochraqualfs
Fox	Fine-loamy over sandy or sandy-skeletal, mixed, mesic Typic Hapludalfs
Grayford	Fine-loamy, mixed, mesic Ultic Hapludalfs
Hennepin	Fine-loamy, mixed, mesic Typic Eutrochrepts
Hickory	Fine-loamy, mixed, mesic Typic Hapludalfs
*Lobdell	Fine-loamy, mixed, mesic Fluvaquentic Eutrochrepts
Martinsville	Fine-loamy, mixed, mesic Typic Hapludalfs
Miami	Fine-loamy, mixed, mesic Typic Hapludalfs
Milford	Fine, mixed, mesic Typic Haplaquolls
Millsdale	Fine, mixed, mesic Typic Argiaquolls
Milton	Fine, mixed, mesic Typic Hapludalfs
Montgomery	Fine, mixed, mesic Typic Haplaquolls
Ockley	Fine-loamy, mixed, mesic Typic Hapludalfs
Orrville	Fine-loamy, mixed, nonacid, mesic Aeric Fluvaquents
Rodman	Sandy-skeletal, mixed, mesic Typic Hapludolls
*Rossmoyne	Fine-silty, mixed, mesic Aquic Fragiudalfs
Russell	Fine-silty, mixed, mesic Typic Hapludalfs
*Ryker	Fine-silty, mixed, mesic Typic Paleudalfs
Sloan	Fine-loamy, mixed, mesic Fluvaquentic Haplaquolls
Starks	Fine-silty, mixed, mesic Aeric Ochraqualfs
Stonelick	Coarse-loamy, mixed (calcareous), mesic Typic Udifluvents
Udorthents	Loamy, mixed, nonacid, mesic Udorthents
Williamstown	Fine-loamy, mixed, mesic Aquic Hapludalfs
Xenia	Fine-silty, mixed, mesic Aquic Hapludalfs

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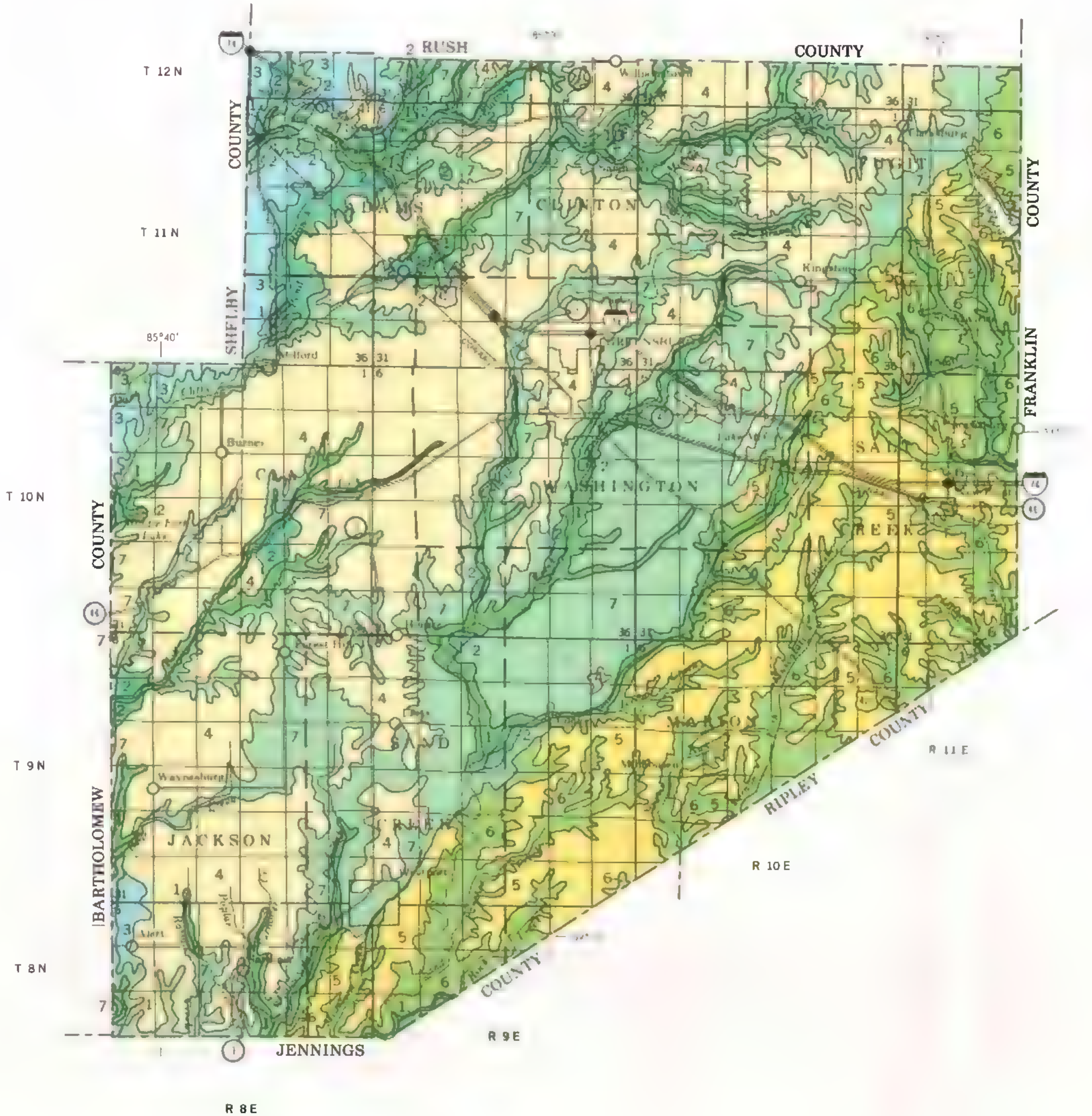
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
PURDUE UNIVERSITY AGRICULTURAL EXPERIMENT STATION
INDIANA DEPARTMENT OF NATURAL RESOURCES
SOIL AND WATER CONSERVATION COMMITTEE

GENERAL SOIL MAP
DECATUR COUNTY, INDIANA

1 0 1 2 3 4 Miles
1 0 1 2 3 4 5 6 Kilometers



SOIL LEGEND

- Chagrin-Lobdell-Orrville: Nearly level, well drained to somewhat poorly drained soils formed in alluvium on flood plains
- Ockley-Martinsville-Fox: Nearly level and gently sloping, well drained soils formed in outwash material on outwash plains, terraces, and kames
- 3 Crosby-Cyclone-Miami: Nearly level and gently sloping, somewhat poorly drained, poorly drained, and well drained soils formed in loess and glacial till on uplands
- 4 Fincastle-Cyclone-Xenia Nearly level and gently sloping, poorly drained to moderately well drained soils formed in loess and glacial till on uplands
- 5 Clermont-Avonburg: Nearly level and gently sloping, poorly drained and somewhat poorly drained soils formed in loess and glacial drift on uplands
- Cincinnati-Rossmoyne-Hickory: Gently sloping to very steep, well drained and moderately well drained soils formed in loess and glacial drift or in glacial till; on uplands
- Miami-Xenia-Williamstown Nearly level to strongly sloping, well drained and moderately well drained soils formed in loess and glacial till on uplands

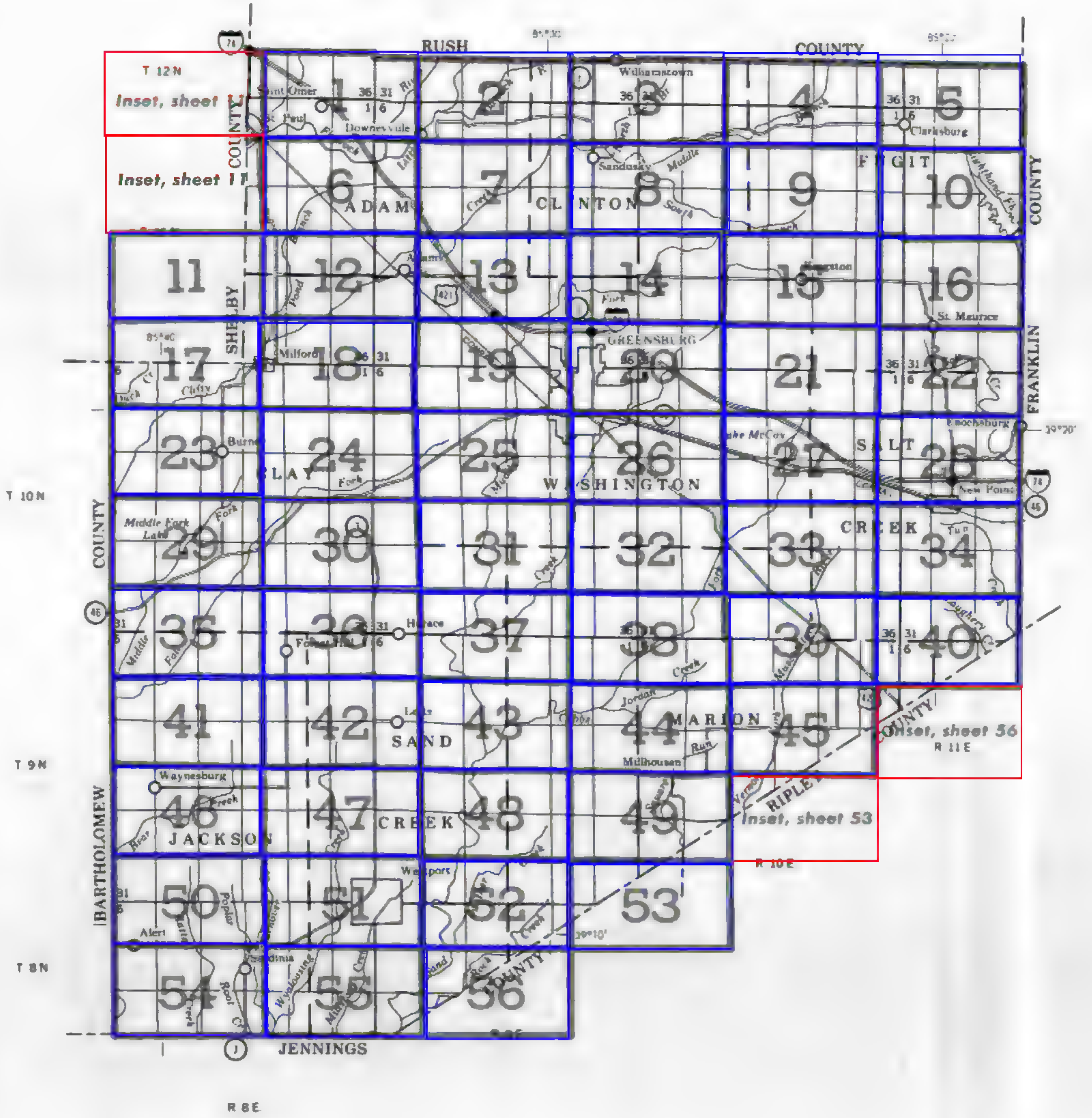
Compiled 1981

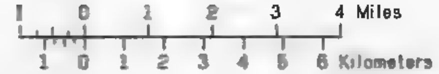
Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rather than a basis for decisions on the use of specific tracts.

SECTIONALIZED TOWNSHIP

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

INDEX TO MAP SHEETS
DECATUR COUNTY, INDIANA





SECTIONALIZED TOWNSHIP

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

SOIL LEGEND

Map symbols consist of a combination of letters or of letters and a number. The first capital letter is the initial one of the map unit name. The lowercase letter that follows separates map units having names that begin with the same letter, except that it does not separate sloping or eroded phases. The second capital letter indicates the class of slope. Symbols without a slope letter are for nearly level soils or miscellaneous areas. A final number of 2 indicates that the soil is eroded and 3 that it is severely eroded.

SYMBOL	NAME
AvA	Avonburg silt loam, 0 to 2 percent slopes
AvB	Avonburg silt loam, 2 to 4 percent slopes
Cg	Chagrin loam, frequently flooded
Ch	Chagrin Variant silt loam, frequently flooded
CkB2	Cincinnati silt loam, 2 to 6 percent slopes, eroded
CkC2	Cincinnati silt loam, 6 to 12 percent slopes, eroded
CkC3	Cincinnati silt loam, 6 to 12 percent slopes, severely eroded
Cm	Clermont silt loam
CnG	Corydon-Rock outcrop complex, 35 to 35 percent slopes
CrA	Crosby silt loam, 0 to 3 percent slopes
Cy	Cyclone silt loam
FcA	Fincastle silt loam, 0 to 2 percent slopes
FcB	Fincastle silt loam, 2 to 4 percent slopes
FoA	Fox loam, 0 to 2 percent slopes
FoB	Fox loam, 2 to 6 percent slopes
GfD	Grayford silt loam, 10 to 20 percent slopes
GrC2	Grayford-Ryker silt loams, 4 to 10 percent slopes, eroded
HeG	Hennepin loam, 35 to 60 percent slopes
HkD2	Hickory loam, 12 to 18 percent slopes, eroded
HkE2	Hickory loam, 18 to 25 percent slopes, eroded
HkF	Hickory loam, 25 to 50 percent slopes
HlD3	Hickory clay loam, 12 to 18 percent slopes, severely eroded
Lb	Lobdell silt loam, frequently flooded
MeA	Martinsville loam, 0 to 2 percent slopes
MeB2	Martinsville loam, 2 to 6 percent slopes, eroded
MmB2	Miami silt loam, 2 to 6 percent slopes, eroded
MmC2	Miami silt loam, 6 to 12 percent slopes, eroded
MmD2	Miami silt loam, 12 to 18 percent slopes, eroded
MoC3	Miami clay loam, 6 to 12 percent slopes, severely eroded
MoD3	Miami clay loam, 12 to 18 percent slopes, severely eroded
Mr	Milford silty clay
Ms	Millsdale silty clay loam
MtA	Milton silt loam, 0 to 2 percent slopes
MtB2	Milton silt loam, 2 to 6 percent slopes, eroded
My	Montgomery silty clay, gravelly substratum
OcA	Ockley silt loam, 0 to 2 percent slopes
OcB	Ockley silt loam, 2 to 6 percent slopes
Or	Orrville silt loam, frequently flooded
RoG	Rodman gravelly sandy loam, 35 to 60 percent slopes
RsB2	Rossmoyne silt loam, 2 to 6 percent slopes, eroded
RuB	Russell silt loam, 1 to 5 percent slopes
So	Sloan silt loam, frequently flooded
Sr	Starks silt loam
St	Stonelick fine sandy loam, frequently flooded
Ud	Udorthents-Pits complex
WmB	Williamstown silt loam, 1 to 5 percent slopes
XnA	Xenia silt loam, 0 to 2 percent slopes
XnB	Xenia silt loam, 2 to 4 percent slopes

CONVENTIONAL AND SPECIAL SYMBOLS LEGEND

CULTURAL FEATURES

BOUNDARIES

- National, state or province
- County or parish
- Minor civil division
- Reservation (national forest or park, state forest or park, and large airport)
- Land grant
- Limit of soil survey (label)
- Field sheet matchline & neatline

AD HOC BOUNDARY (label)

- Small airport, airfield, park, oilfield, cemetery, or flood pool (Davis Airstrip; FLOOD POOL LINE)

STATE COORDINATE TICK

LAND DIVISION CORNERS (sections and land grants)

ROADS

- Divided (median shown if scale permits)
- Other roads
- Trail

ROAD EMBLEMS & DESIGNATIONS

- Interstate (79)
- Federal (410)
- State (52)
- County, farm or ranch (378)

RAILROAD

POWER TRANSMISSION LINE (normally not shown)

PIPE LINE (normally not shown)

FENCE (normally not shown)

LEVEES

- Without road
- With road
- With railroad

DAMS

- Large (to scale)
- Medium or small (water; w)

PITS

- Gravel pit
- Mine or quarry

MISCELLANEOUS CULTURAL FEATURES

- Farmstead, house (omit in urban areas)
- Church
- School
- Indian mound (label) (Indian Mound)
- Located object (label) (Tower)
- Tank (label) (GAS)
- Wells, oil or gas
- Windmill
- Kitchen midden

WATER FEATURES

DRAINAGE

- Perennial, double line
- Perennial, single line
- Intermittent
- Drainage end
- Canals or ditches
  - Double-line (label) (CANAL)
  - Drainage and/or irrigation

LAKES, PONDS AND RESERVOIRS

- Perennial (water; w)
- Intermittent (int; i)

MISCELLANEOUS WATER FEATURES

- Marsh or swamp
- Spring
- Well, artesian
- Well, irrigation
- Wet spot

SPECIAL SYMBOLS FOR SOIL SURVEY

SOIL DELINEATIONS AND SYMBOLS (MeB2; Ch)

ESCARPMENTS

- Bedrock (points down slope)
- Other than bedrock (points down slope)

SHORT STEEP SLOPE

GULLY

DEPRESSION OR SINK

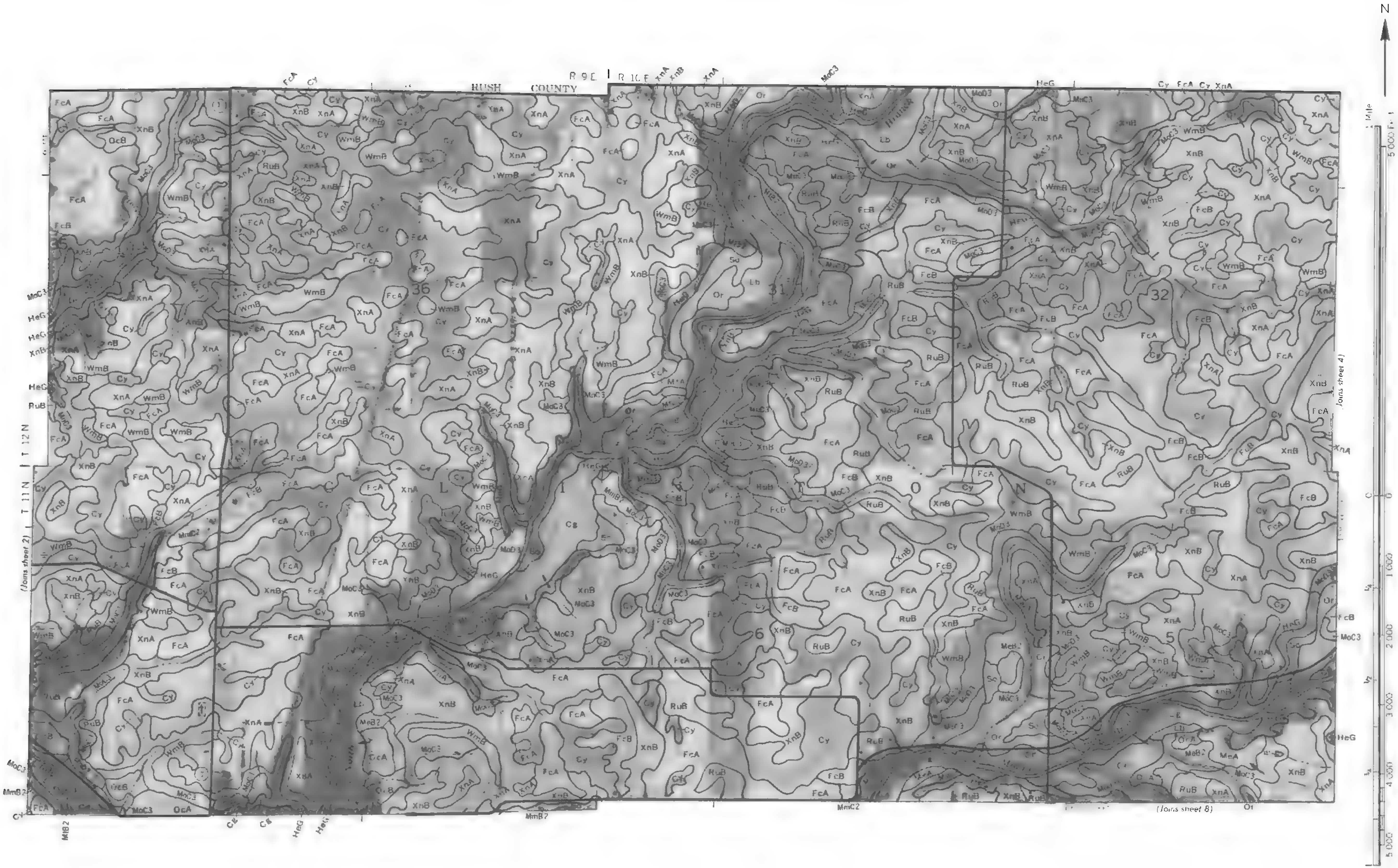
SOIL SAMPLE SITE (normally not shown)

MISCELLANEOUS

- Blowout
- Clay spot
- Gravelly spot
- Gumbo, slick or scabby spot (sodic)
- Dumps and other similar non soil areas
- Prominent hill or peak
- Rock outcrop (includes sandstone and shale)
- Saline spot
- Sandy spot
- Severely eroded spot
- Slide or slip (tips point upslope)
- Stony spot, very stony spot
- Bedrock 40 to 60 inches below the surface
- Bedrock 20 to 40 inches below the surface
- Sanitary landfill up to 5 acres in size


RUSH COUNTY
R 8 E. | R 9 E.
T. 12 N.
T. 11 N.
Saint Omer
(Joins inset A, sheet 11)
(Joins sheet 2)
(Joins sheet 6)
FLATROCK RIVER
LITTLE FLATROCK RIVER
1 Mile
5,000 Feet

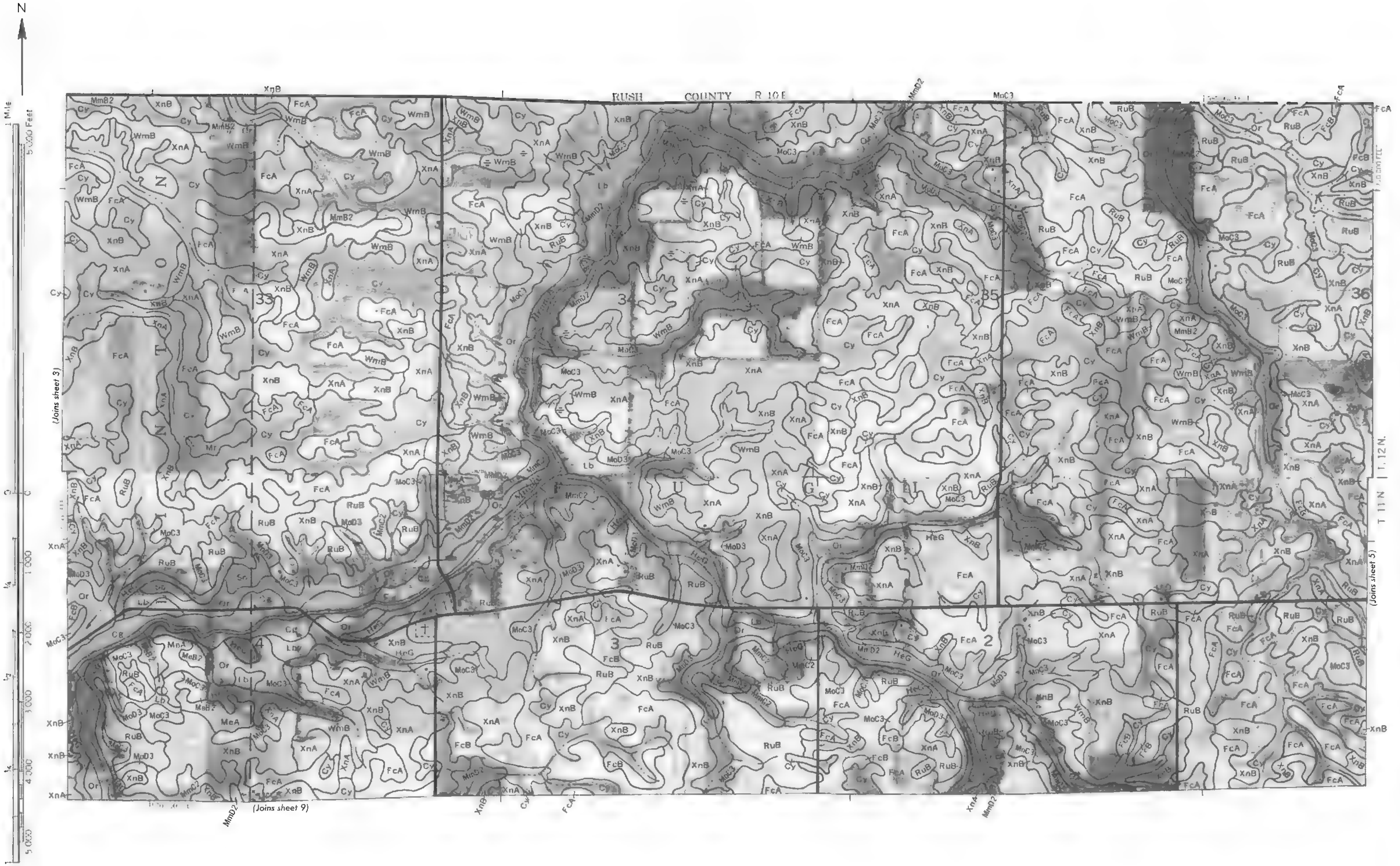
DECATUR COUNTY, INDIANA NO. 2



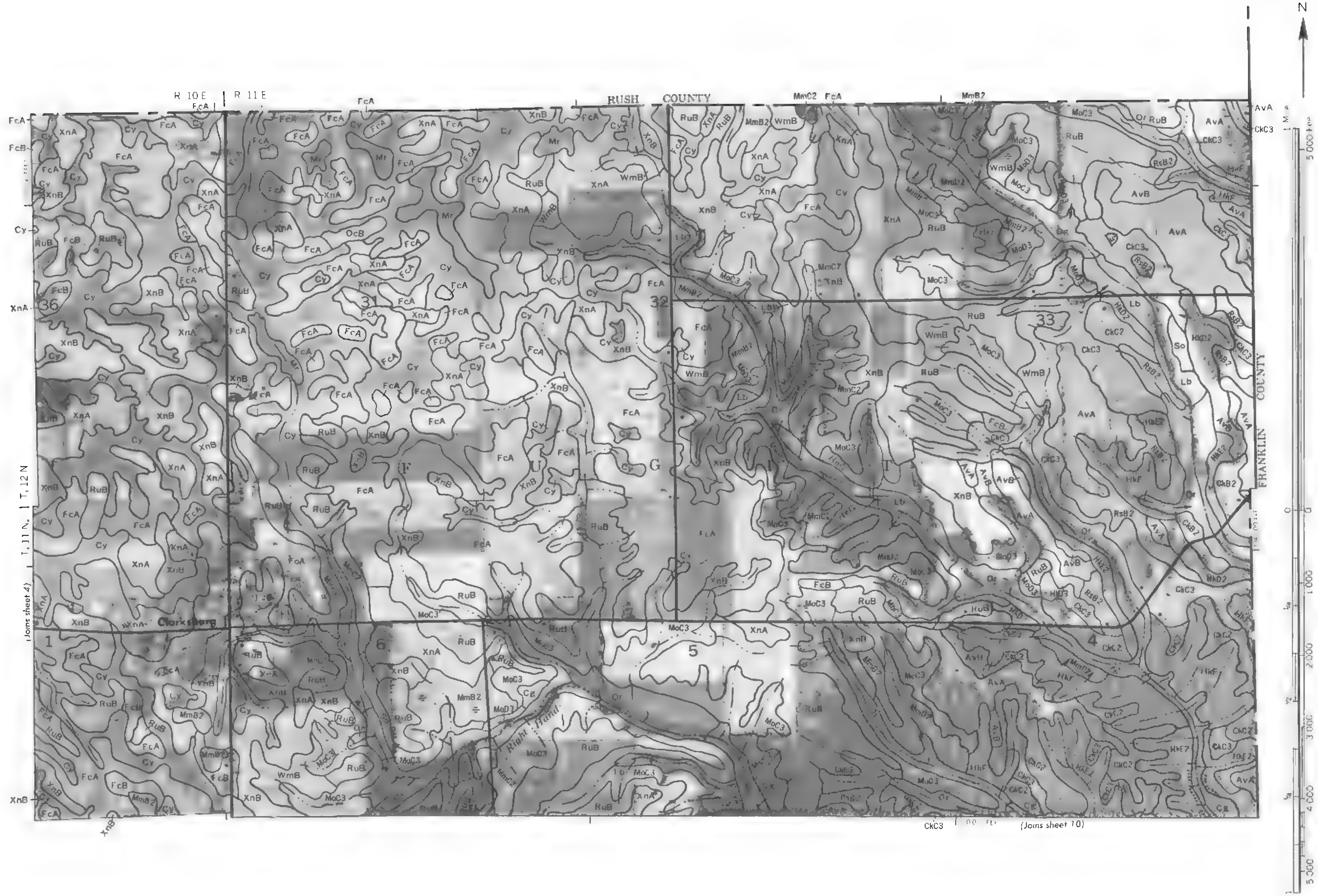
N
RUSH COUNTY
R 9 E
R 10 E
T 12 N
T 11 N
(Joins sheet 2)
(Joins sheet 4)
(Joins sheet 8)
36
31
32
6
5
1 Mile
5 000 Feet
0
1 000
2 000
3 000
4 000
5 000

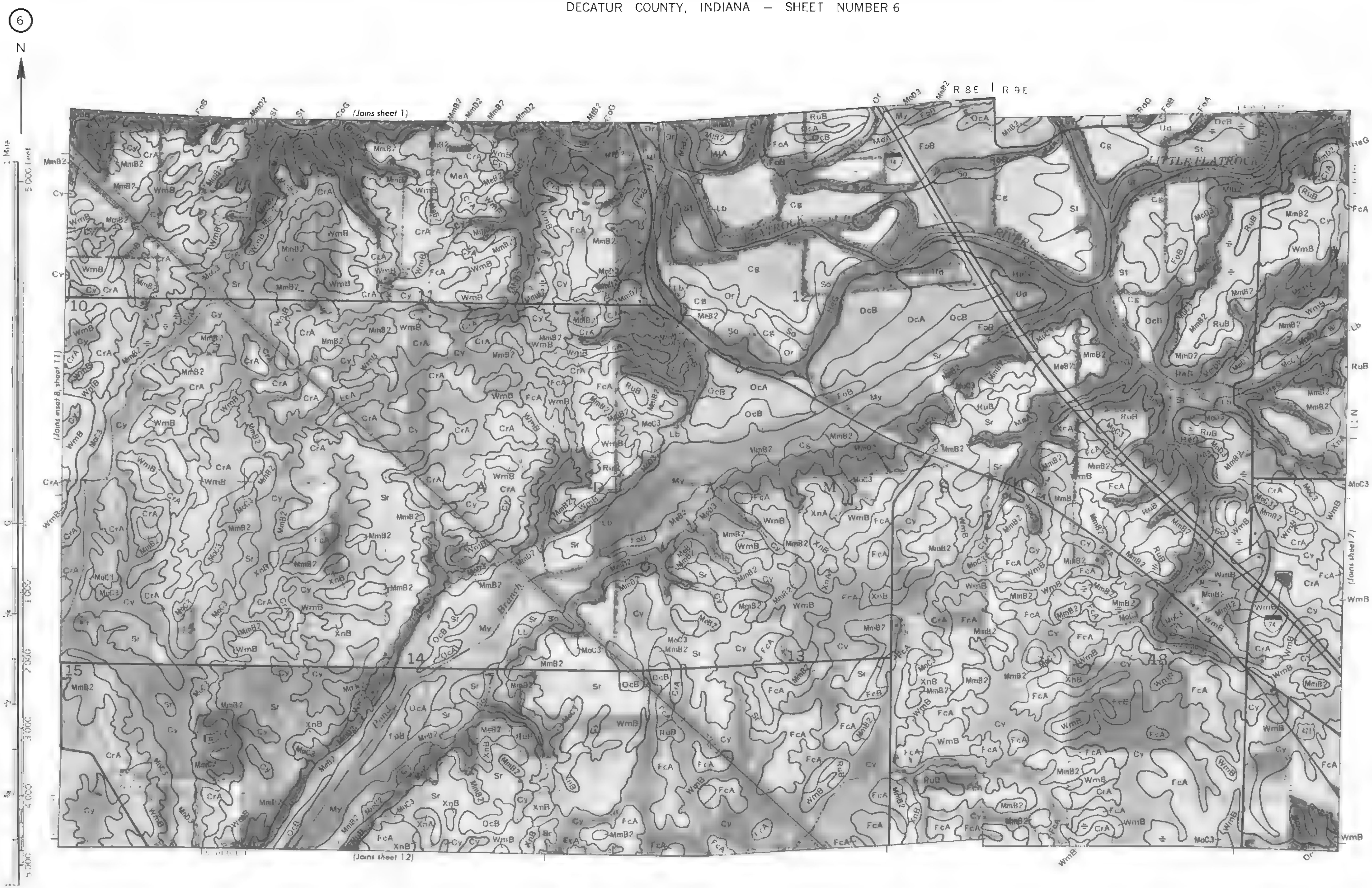
DECATUR COUNTY, INDIANA — SHEET NUMBER 4

4



DECATUR COUNTY, INDIANA NO. 4

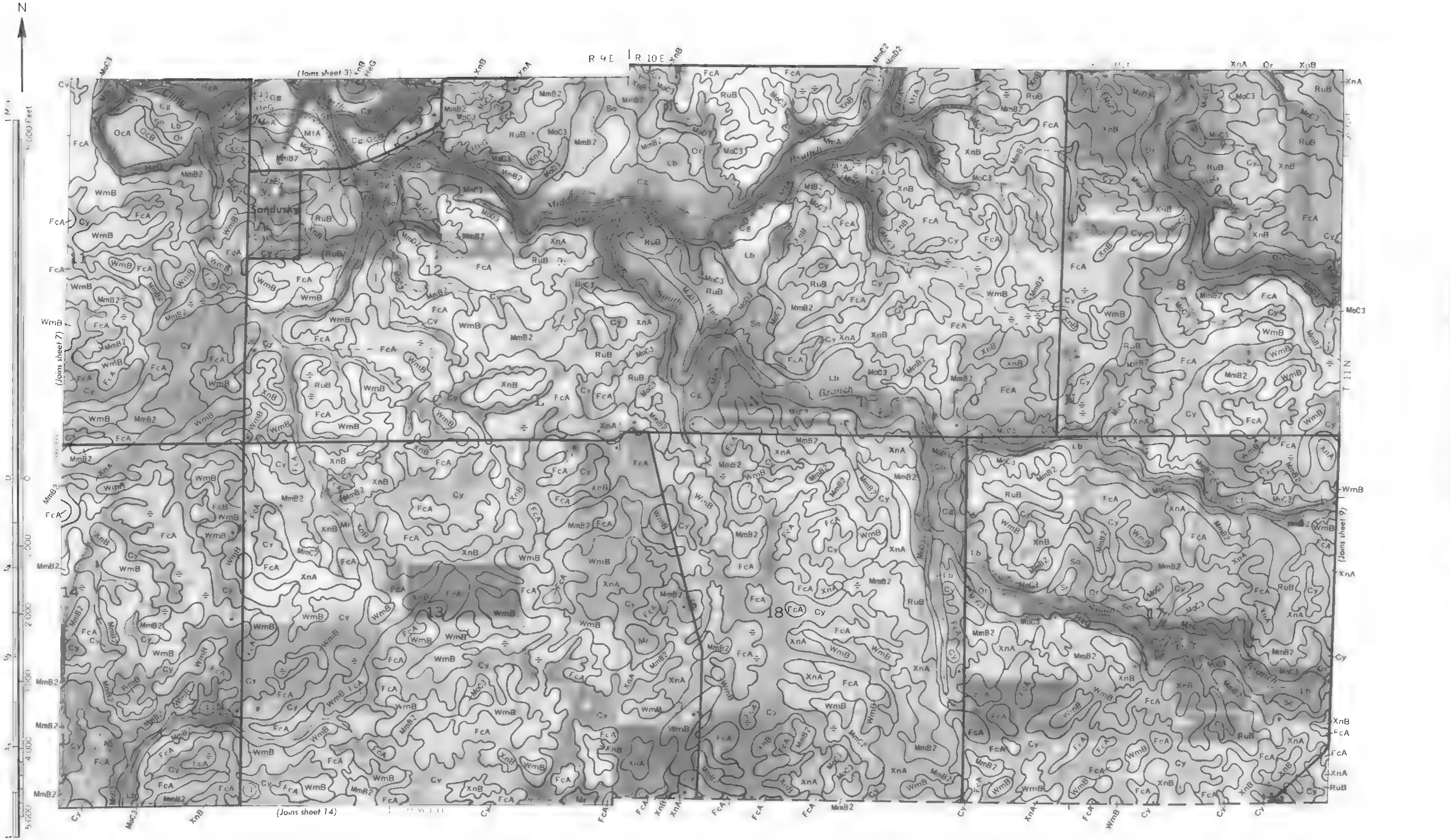

N
R 10 E
R 11 E
RUSH COUNTY
FRANKLIN COUNTY
T. 11 N.
T. 12 N.
Clarksburg
Right Hand
(Joins sheet 4)
(Joins sheet 10)
36
31
32
33
1
6
5
4



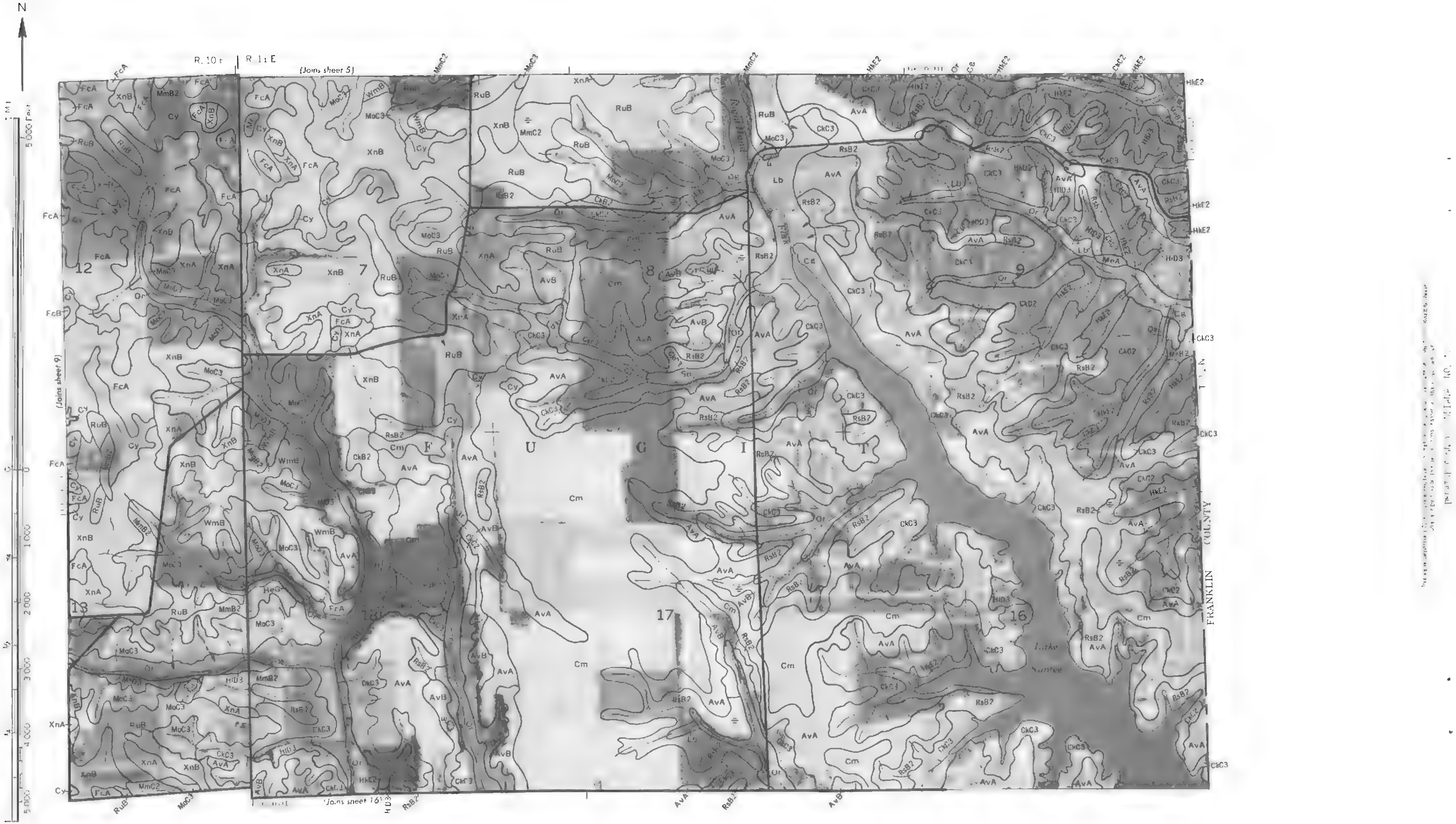
DECATUR COUNTY, INDIANA NO. 6


7
N
(Joins sheet 2)
(Joins sheet 8)
(Joins sheet 13)
(Joins sheet 6)
R. 9 E.
T. 11 N.
A D A M S
1 Mile
5000 Feet

8


N
R 9 E
R 10 E
(Joins sheet 3)
(Joins sheet 7)
(Joins sheet 9)
(Joins sheet 14)
Sandusky
T 11 N
4 000 Feet
5 000 Feet
7
8
11
12
13
14
17
18


N
R 10 E
T 11 N
(Joins sheet 4)
(Joins sheet 10)
(Joins sheet 15)
(Joins sheet 8)
9
10
11
12
13
14
15
16
5 000 Feet

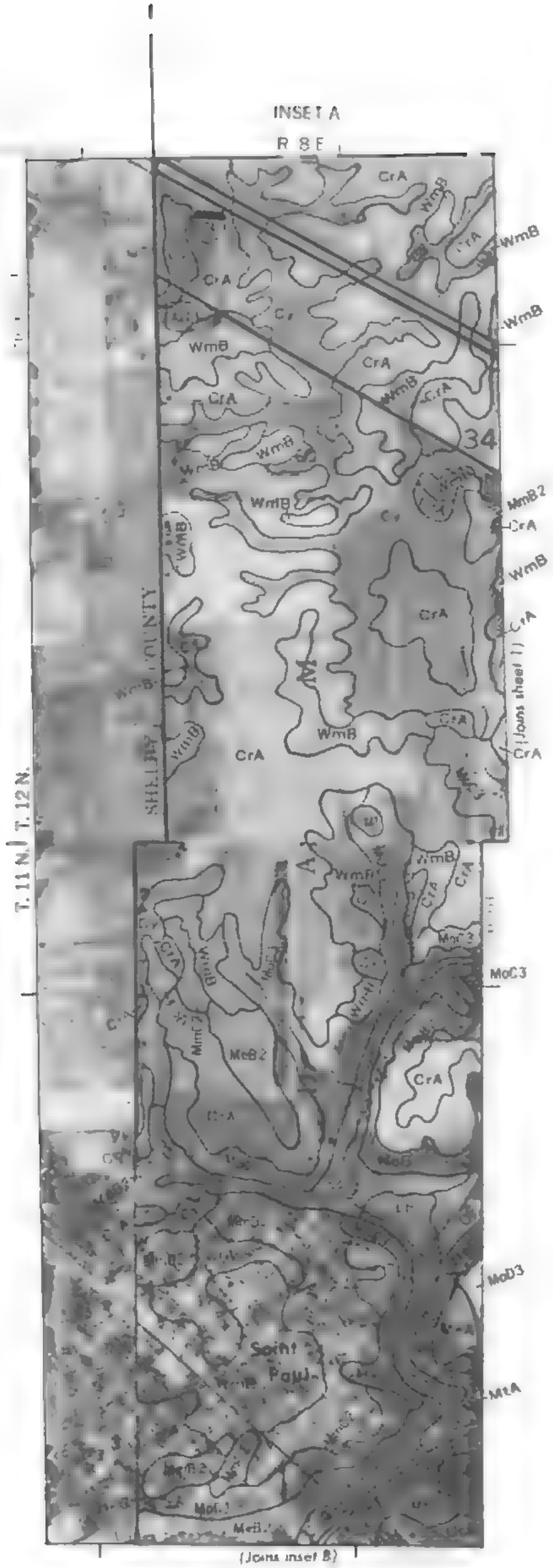

10
N
R. 10 E.
R. 11 E.
(Joins sheet 5)
(Joins sheet 9)
(Joins sheet 16)
FRANKLIN COUNTY
Lake Santee
5 000 Feet

11

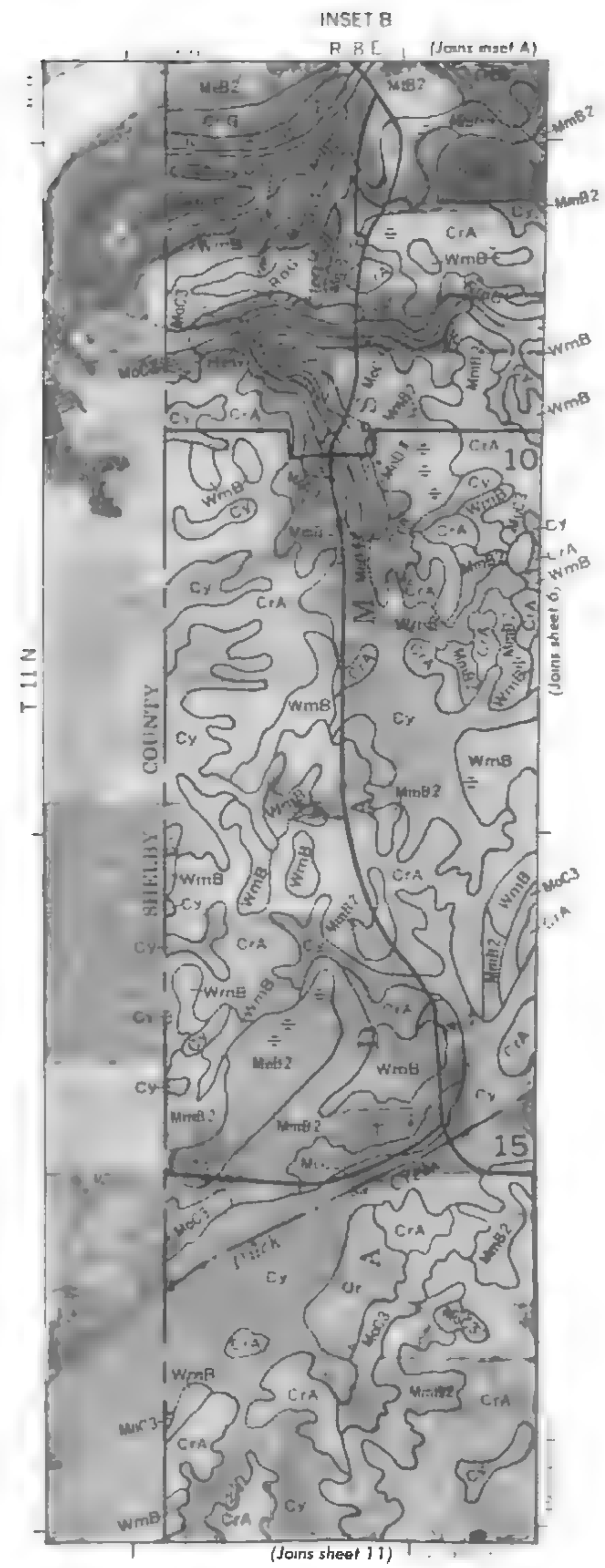
DECATUR COUNTY, INDIANA NO. 11

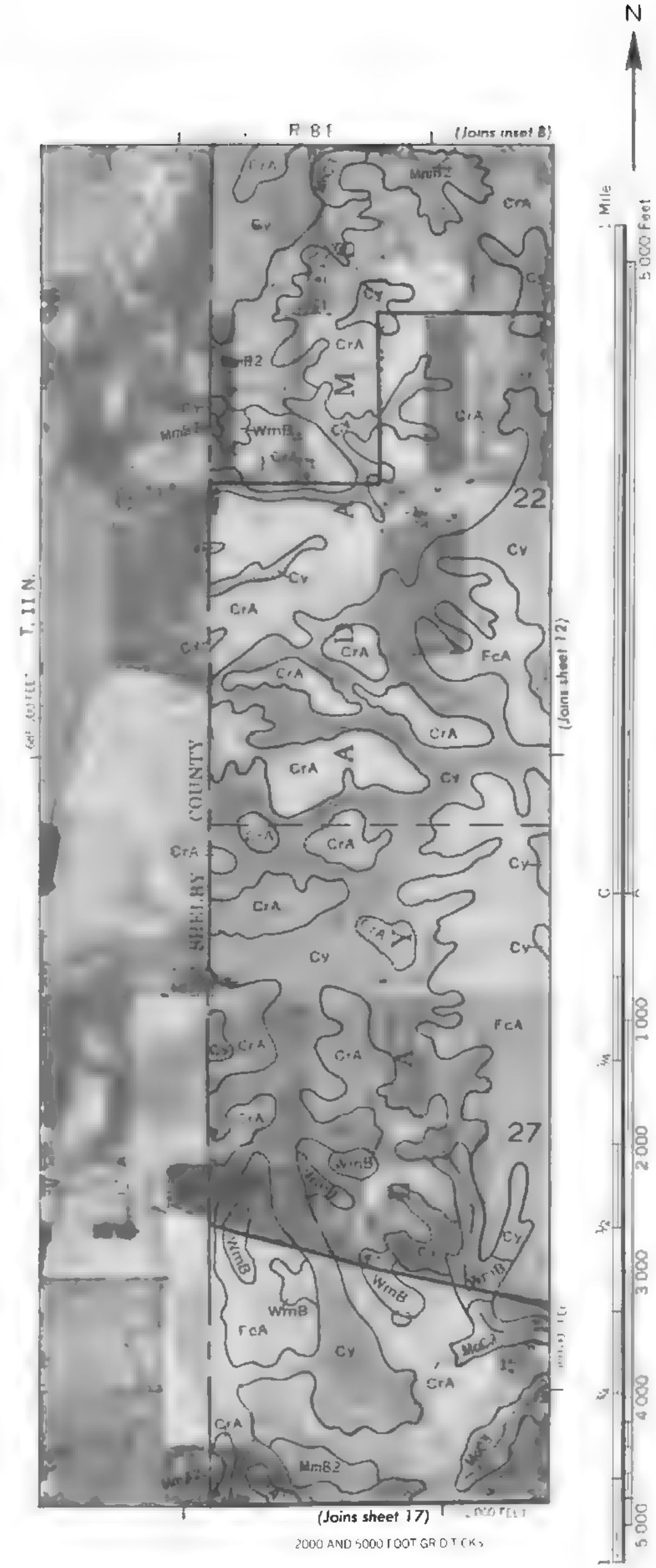
This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

INSET A



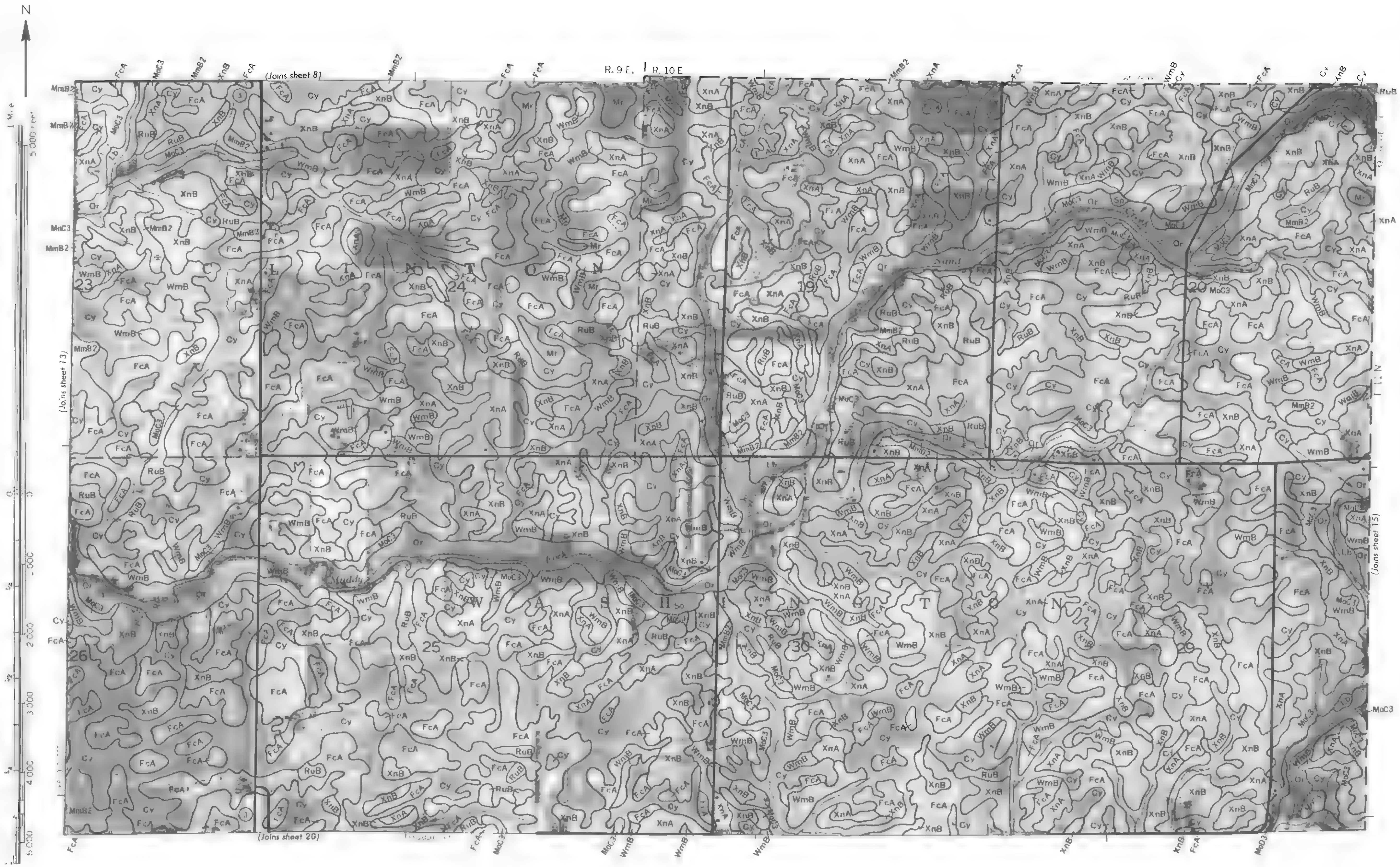
INSET B



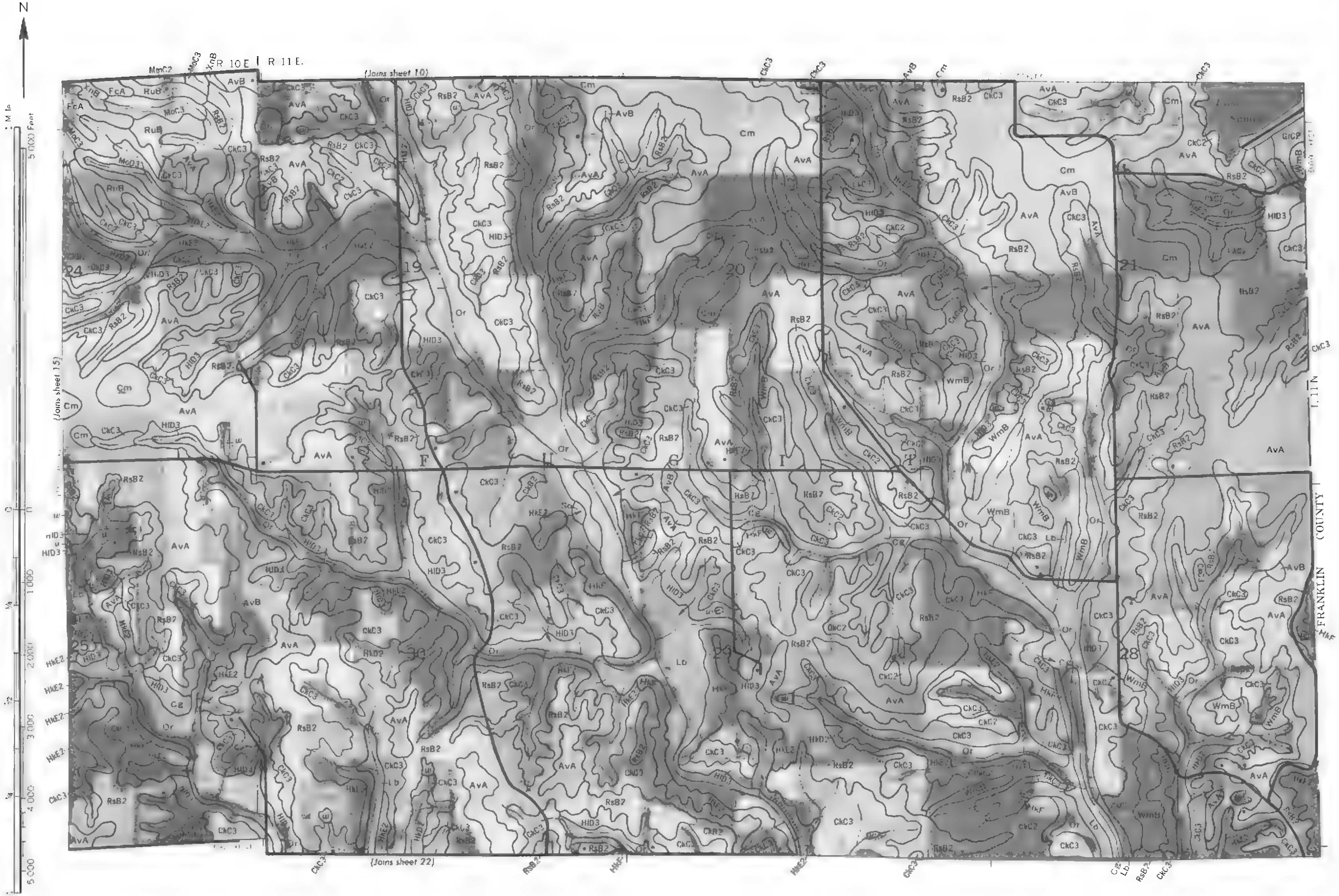



12
N
5000 Feet
R 8 E | R 9 E
(Joins sheet 6)
(Joins sheet 11)
(Joins sheet 13)
(Joins sheet 18)
T 11 N
Adams
22
23
24
19
26
25
30
27


N
(Joins sheet 7)
R. 9 E.
(Joins sheet 14)
(Joins sheet 19)
(Joins sheet 12)
1 Mile
5 000 Feet

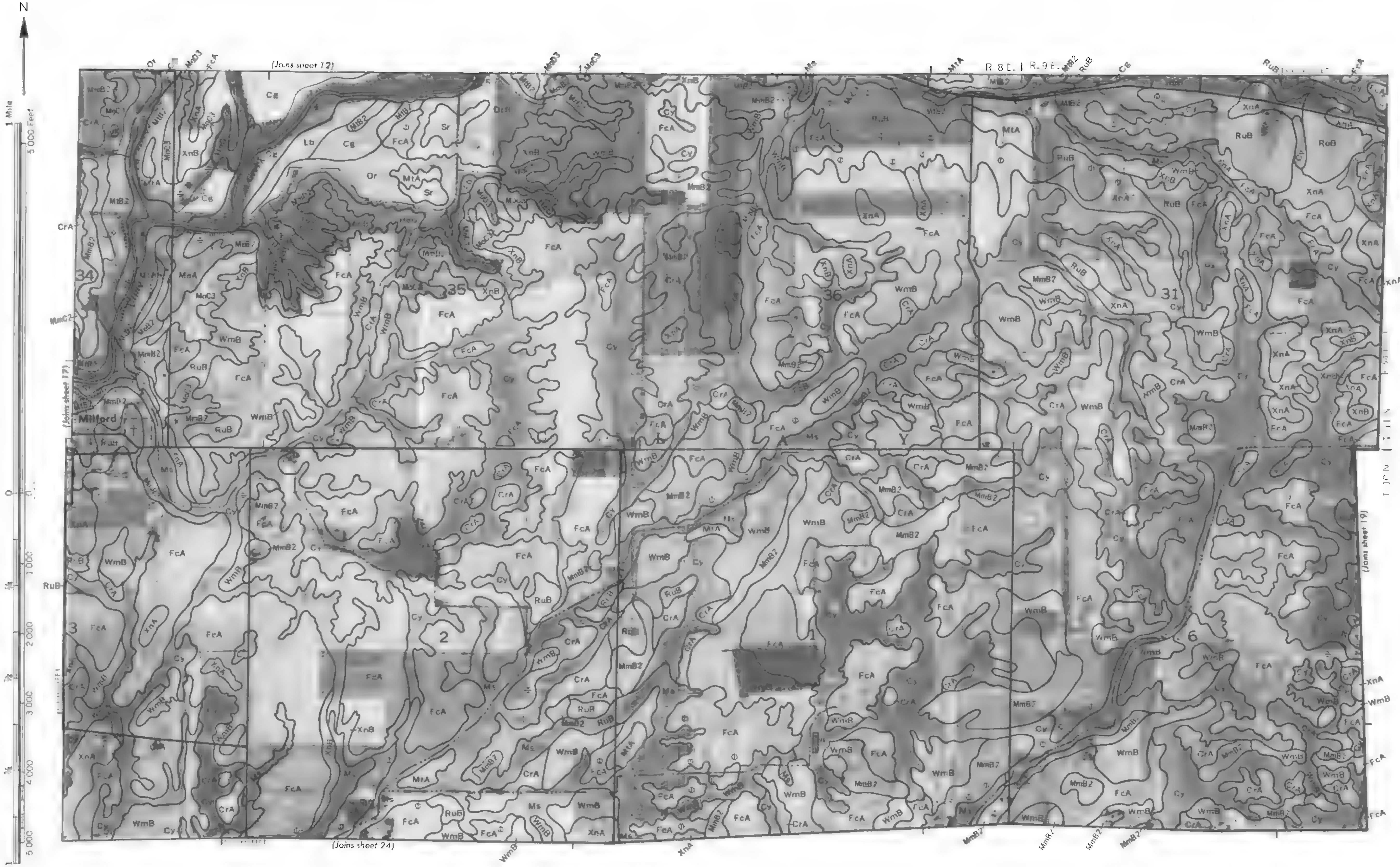

N
1 Mile
5 000 Feet
(Joins sheet 8)
R. 9 E.
R. 10 E.
(Joins sheet 13)
(Joins sheet 15)
(Joins sheet 20)
23
24
19
20
26
25
30
29
CLINTON
WASHINGTON
Sand Creek
Muddy Fork


N
R 10 E.
(Joins sheet 9)
(Joins sheet 16)
(Joins sheet 21)
(Joins sheet 14)
Kingston
21
22
23
24
25
26
27
28


N
R 10 E.
R 11 E.
(Joins sheet 10)
(Joins sheet 15)
(Joins sheet 22)
FRANKLIN COUNTY
T. 11 N.
1 Mile
5 000 Feet

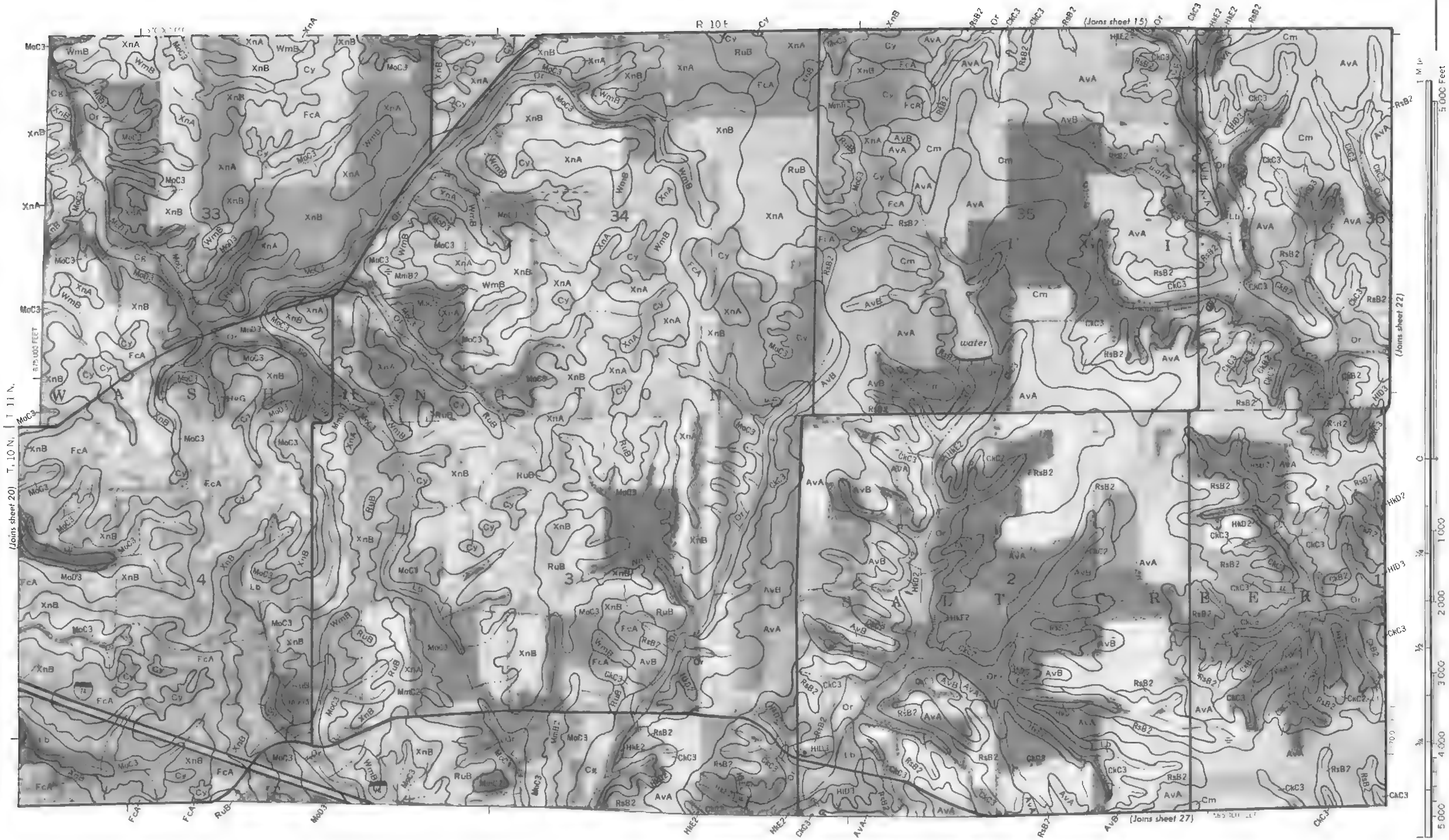

17
N
(Joins sheet 11)
(Joins sheet 18)
(Joins sheet 23)
SHELBY COUNTY
BARTHOLOMEW COUNTY
Milford
R 8 E
T 11 N
T 10 N
34
6
4
3
1 Mile
5 000 Feet

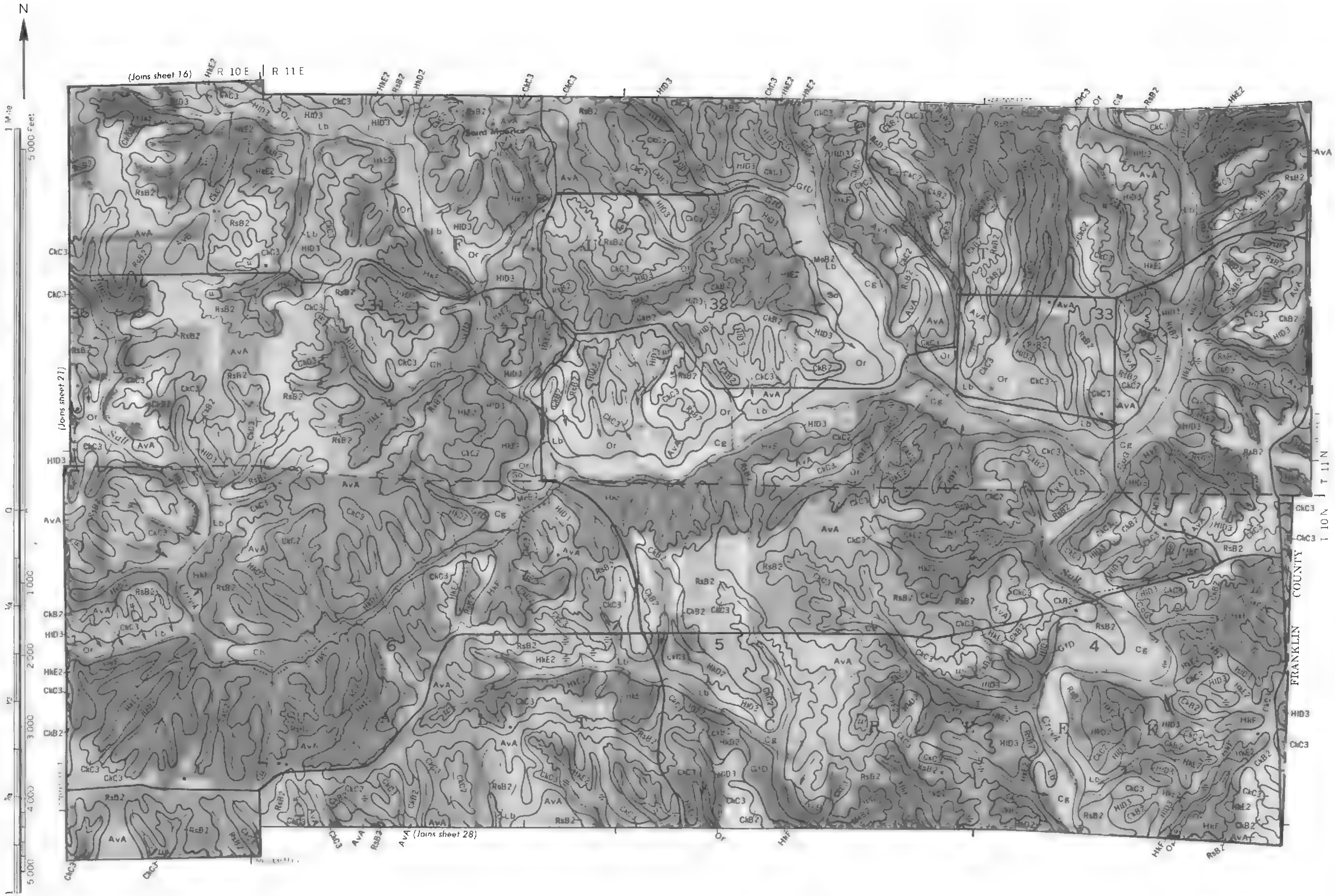
DECATUR COUNTY INDIANA — SHEET NUMBER 18

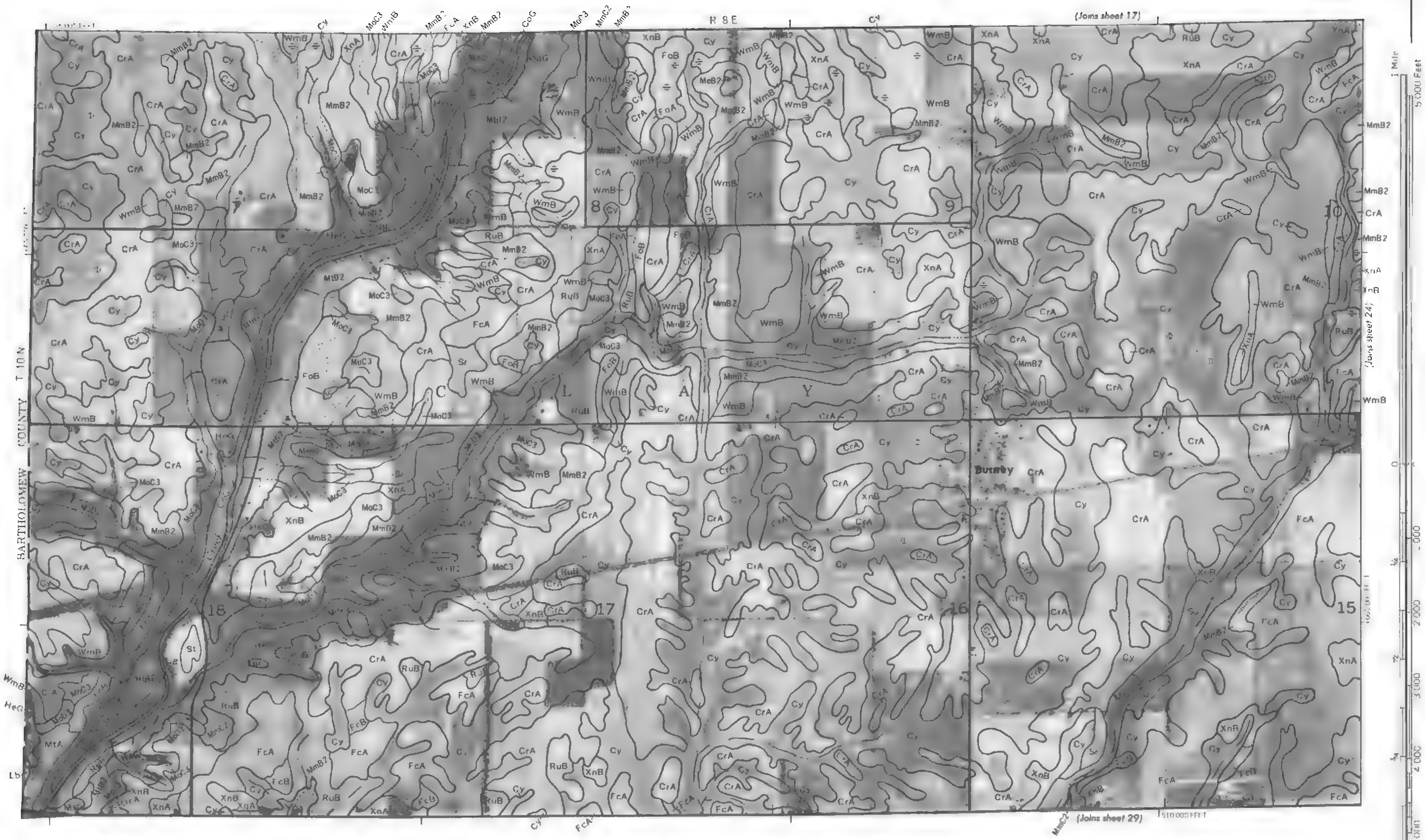


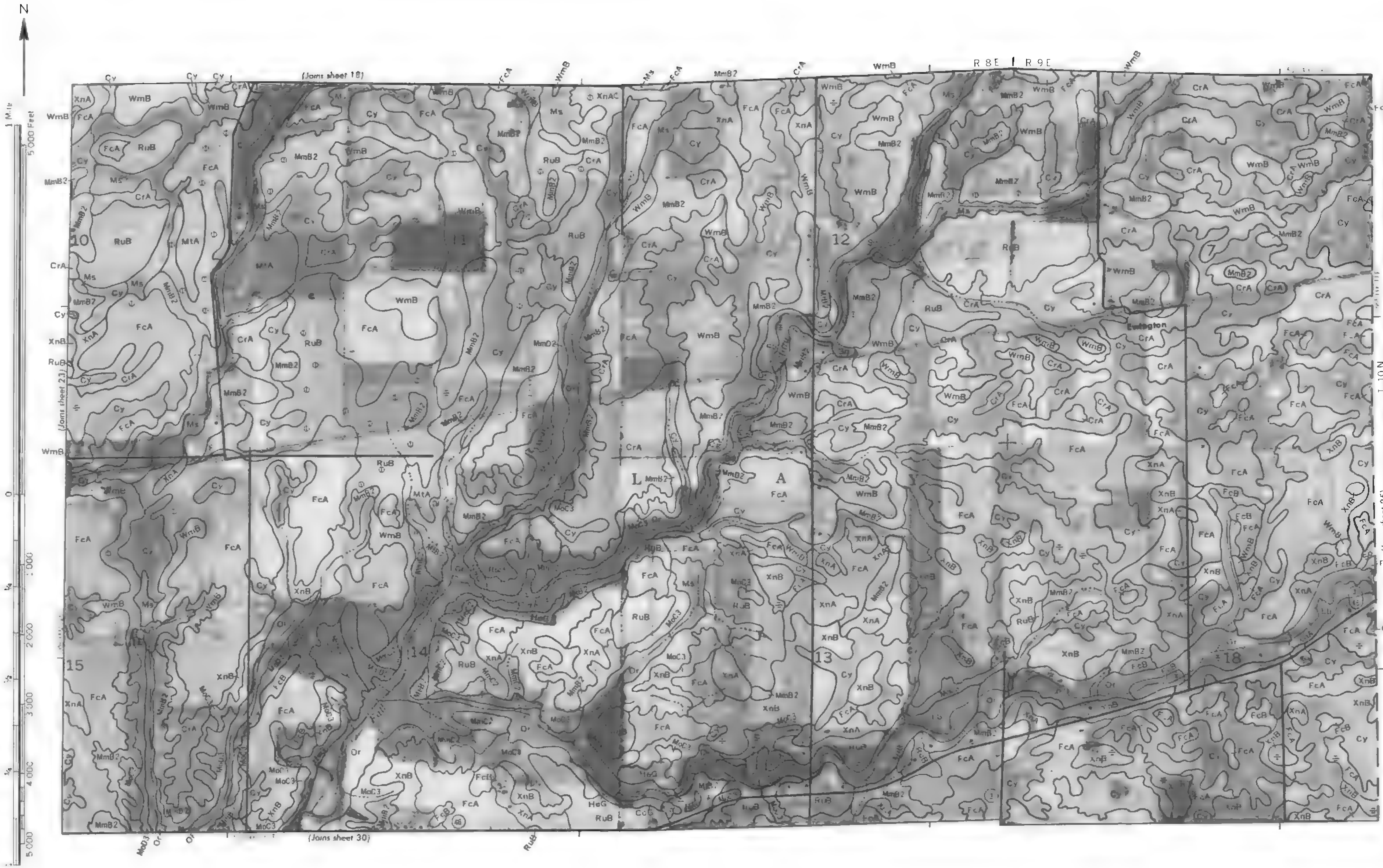

N
(Joins sheet 13)
(Joins sheet 20)
(Joins sheet 25)
(Joins sheet 18)
R 9 E
T 11 N
T 10 N
32
33
34
35
3
2
5
GREENSBURG
5 000 Feet

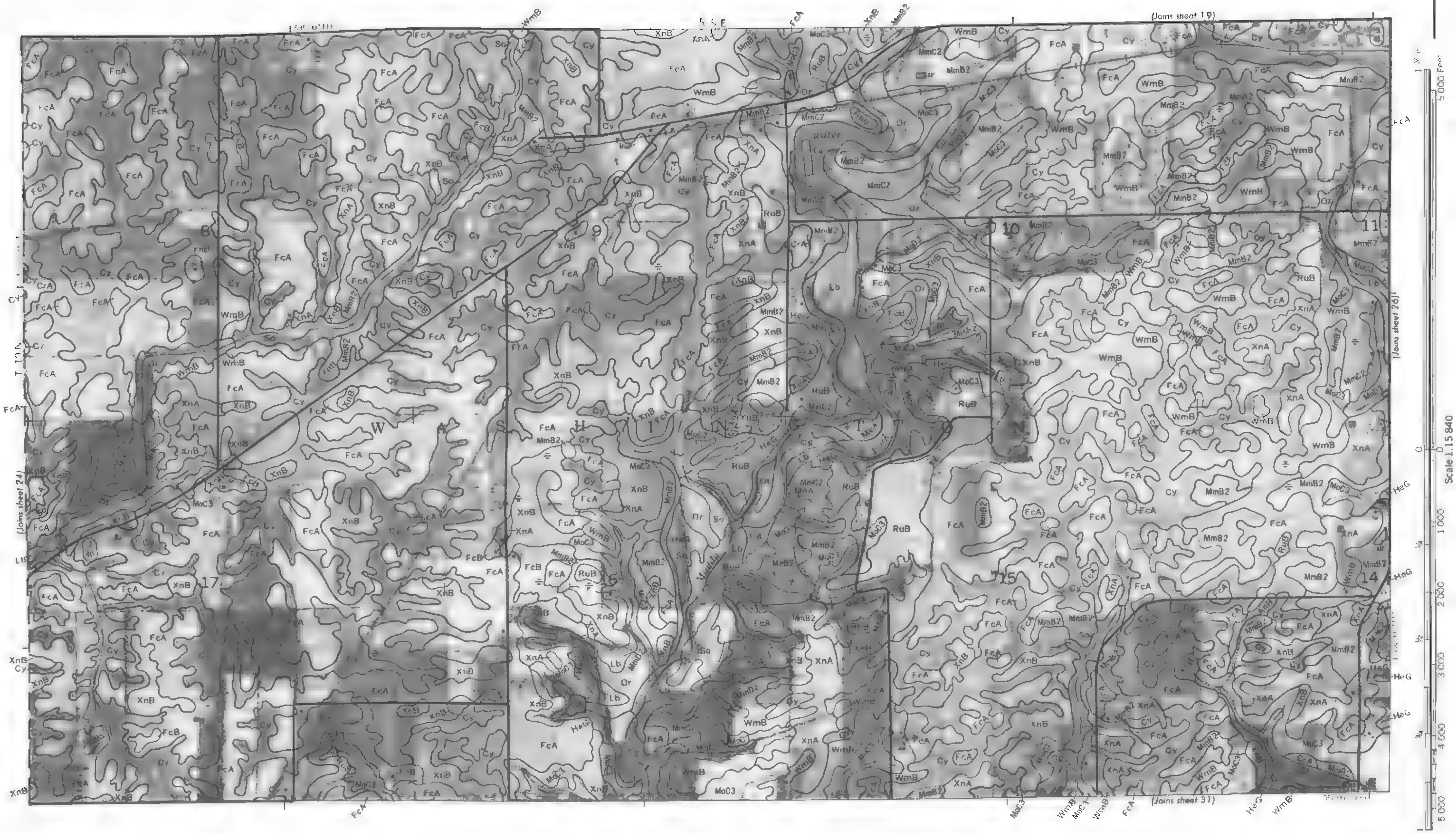

N
(Joins sheet 14)
(Joins sheet 19)
(Joins sheet 21)
(Joins sheet 26)
R 9 E
R 10 E
T. 11 N.
T. 10 N.
GREENSBURG
35
36
31
32
2
1
6
W
A
S
H
I
N
G
T
O
N
Sand Creek


21
N
(Joins sheet 15)
(Joins sheet 20)
(Joins sheet 22)
(Joins sheet 27)
R. 10 E.
T. 10 N.
T. 11 N.
WASHINGTON
SALT CREEK
water
1 Mile
5 000 Feet

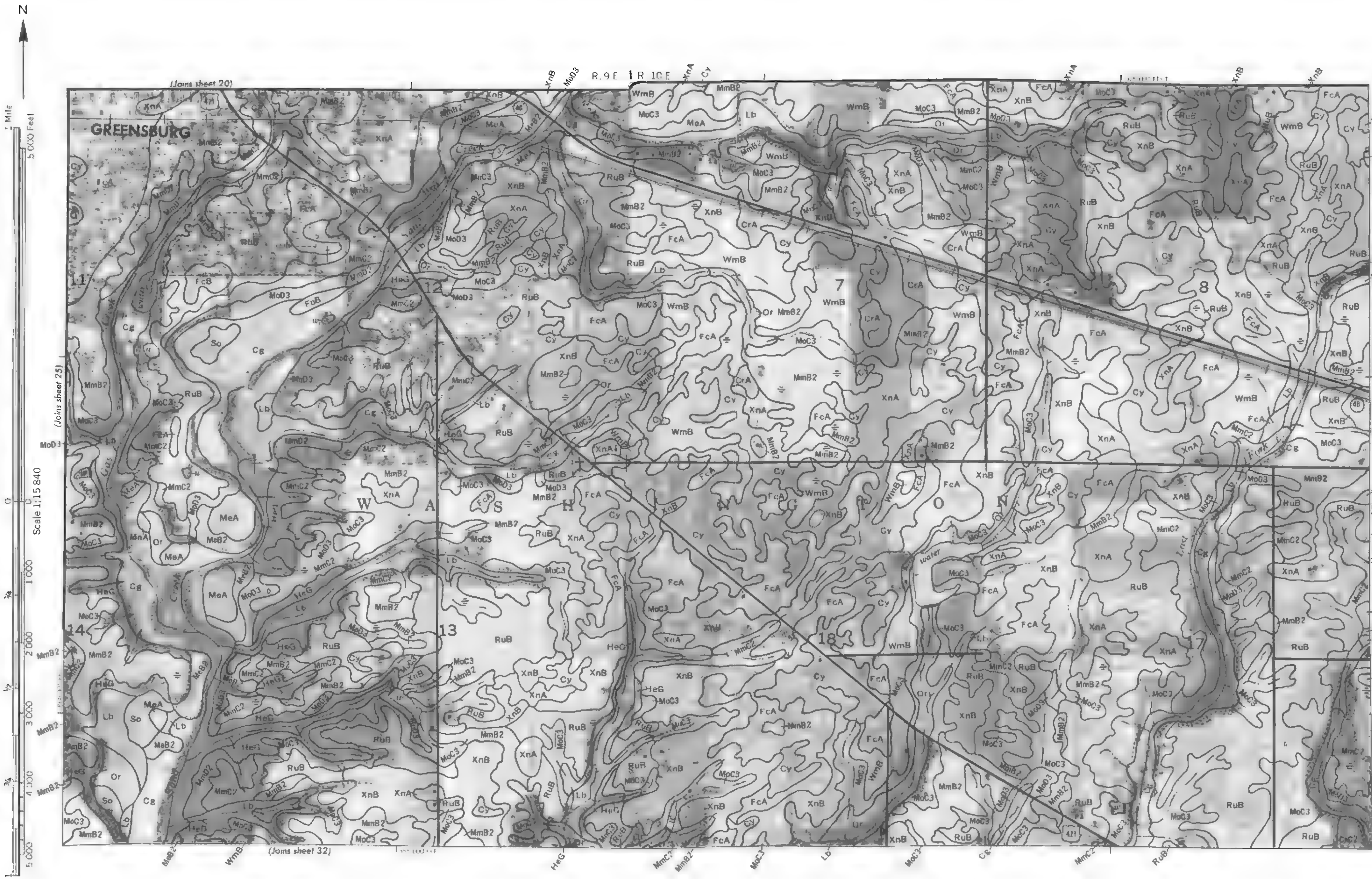

N
(Joins sheet 16)
R 10 E
R 11 E
(Joins sheet 21)
(Joins sheet 28)
T 11 N
T 10 N
FRANKLIN COUNTY
1 Mile
5 000 Feet
33
32
31
6
5
4

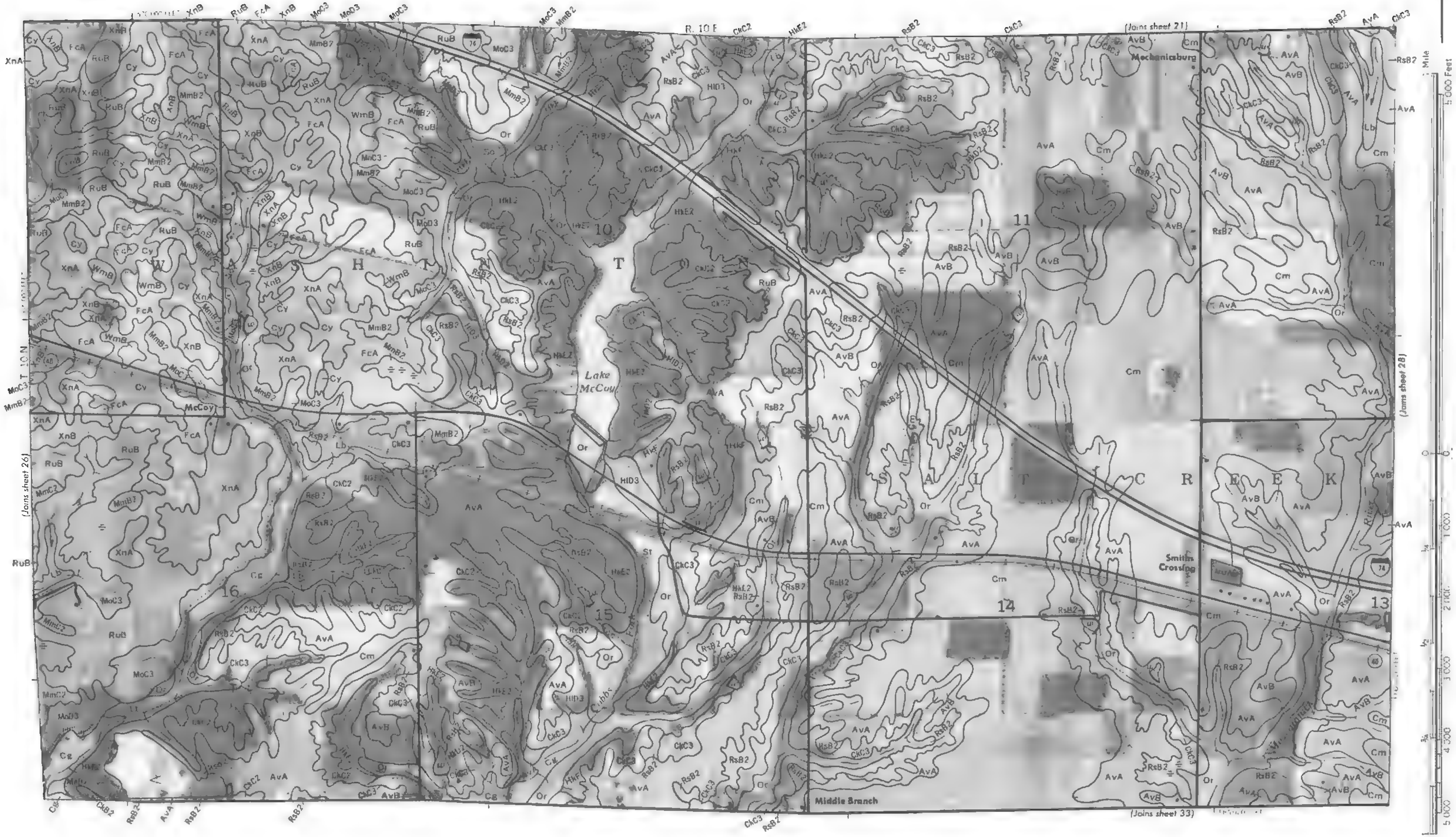

(Joins sheet 17)
R 8 E
(Joins sheet 24)
(Joins sheet 29)
BARTHOLOMEW COUNTY
T 10 N
C L A Y
Burney
8
9
10
15
16
17
18
N
1 Mile
5000 Feet

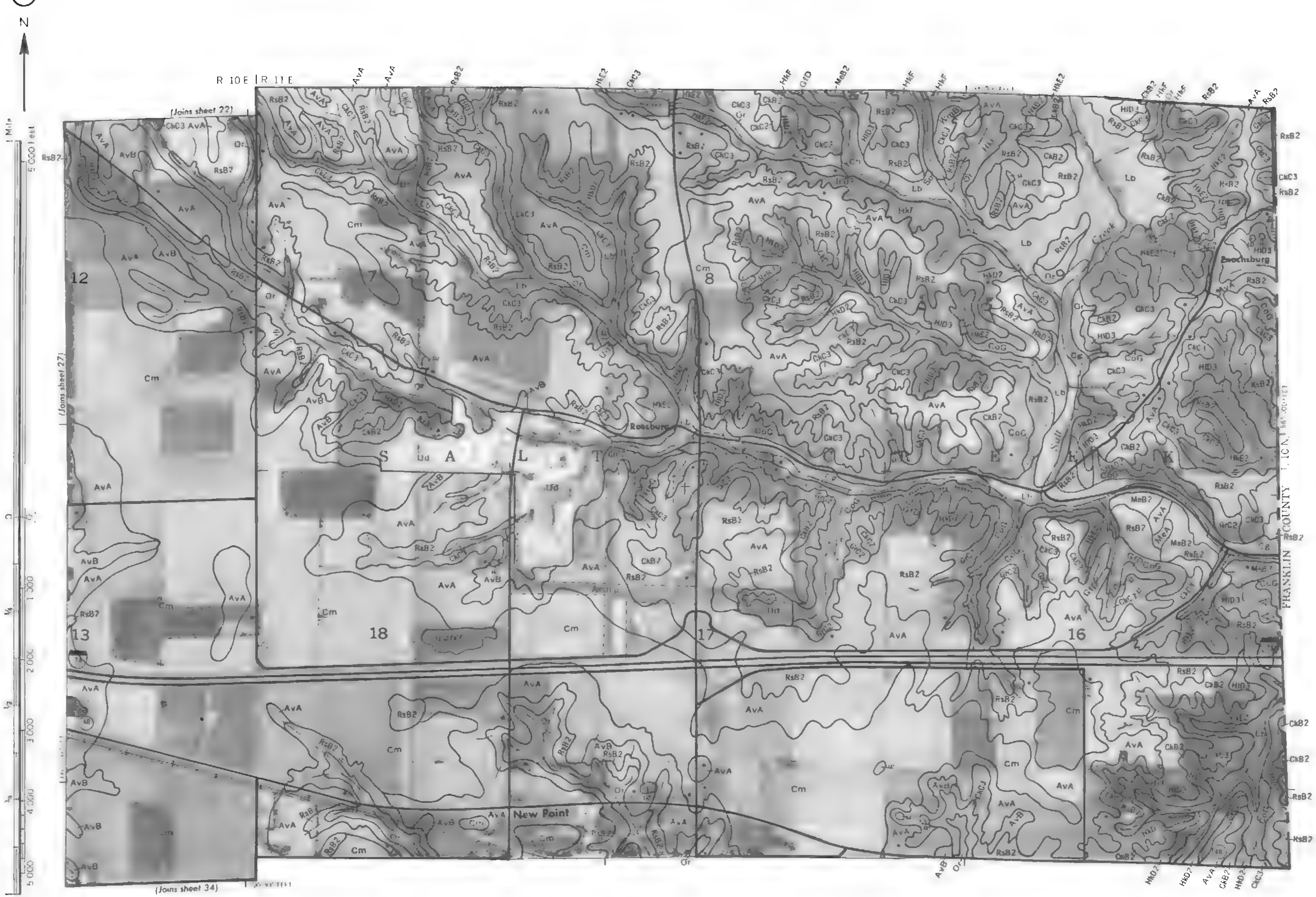

N
(Joins sheet 18)
(Joins sheet 30)
(Joins sheet 23)
(Joins sheet 25)
R 8 E
R 9 E
T. 10 N.
Ewington
1 Mile
5 000 Feet

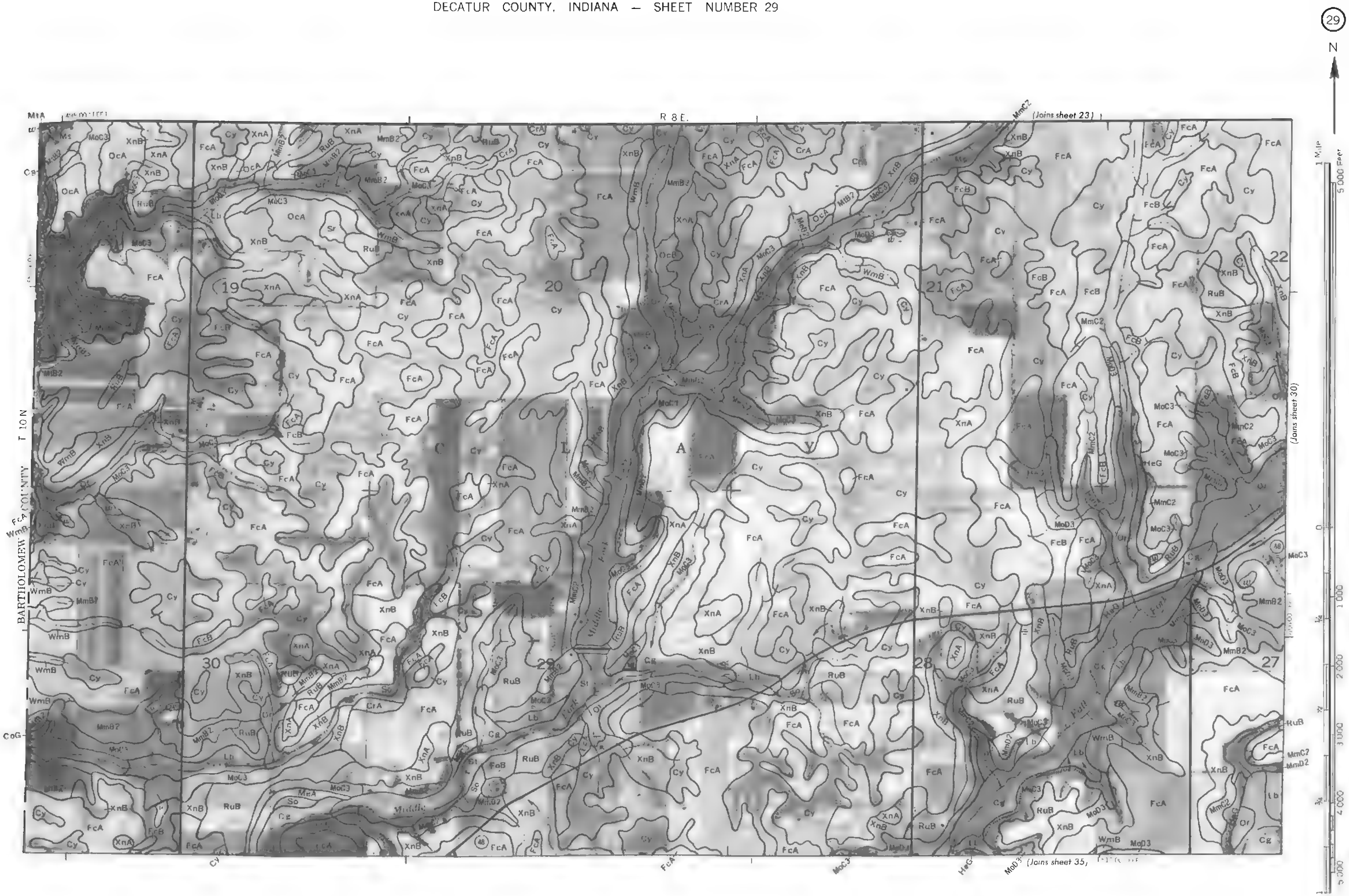

N
(Joins sheet 19)
(Joins sheet 26)
(Joins sheet 31)
(Joins sheet 24)
Scale 1:15 840
1 Mile
5 000 Feet
W A S H I N G T O N
8
9
10
11
14
15
17

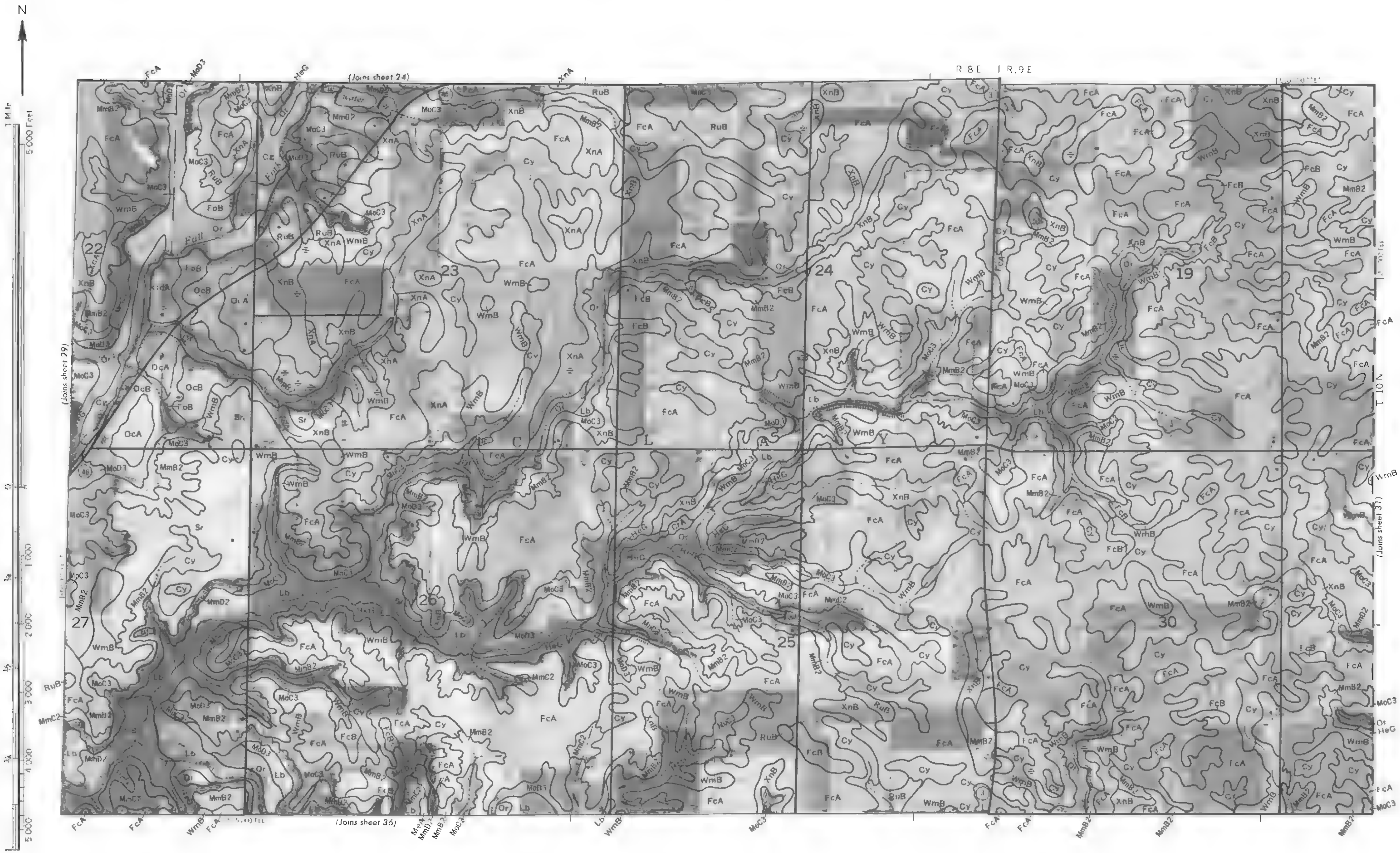
DECATUR COUNTY, INDIANA — SHEET NUMBER 26

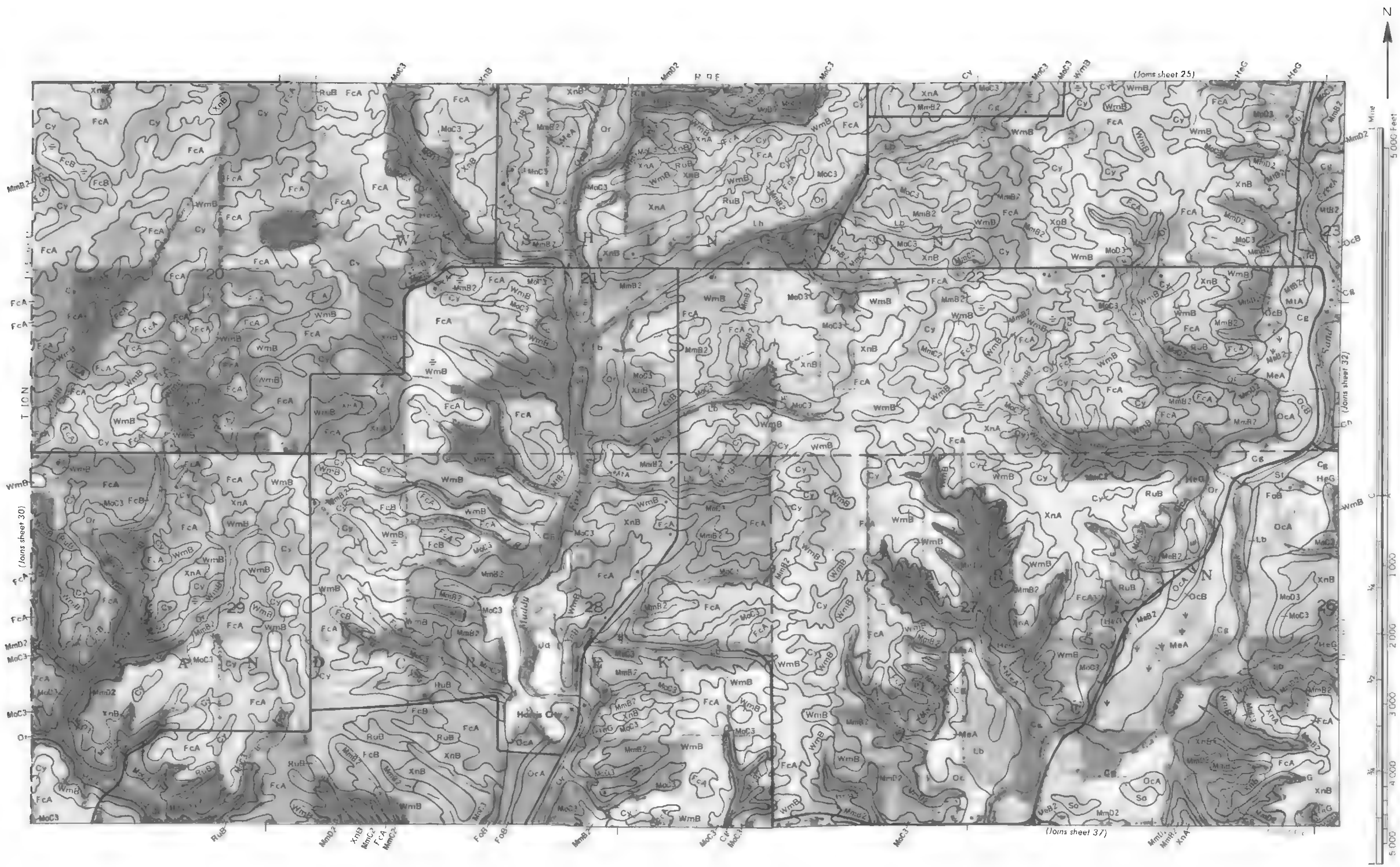


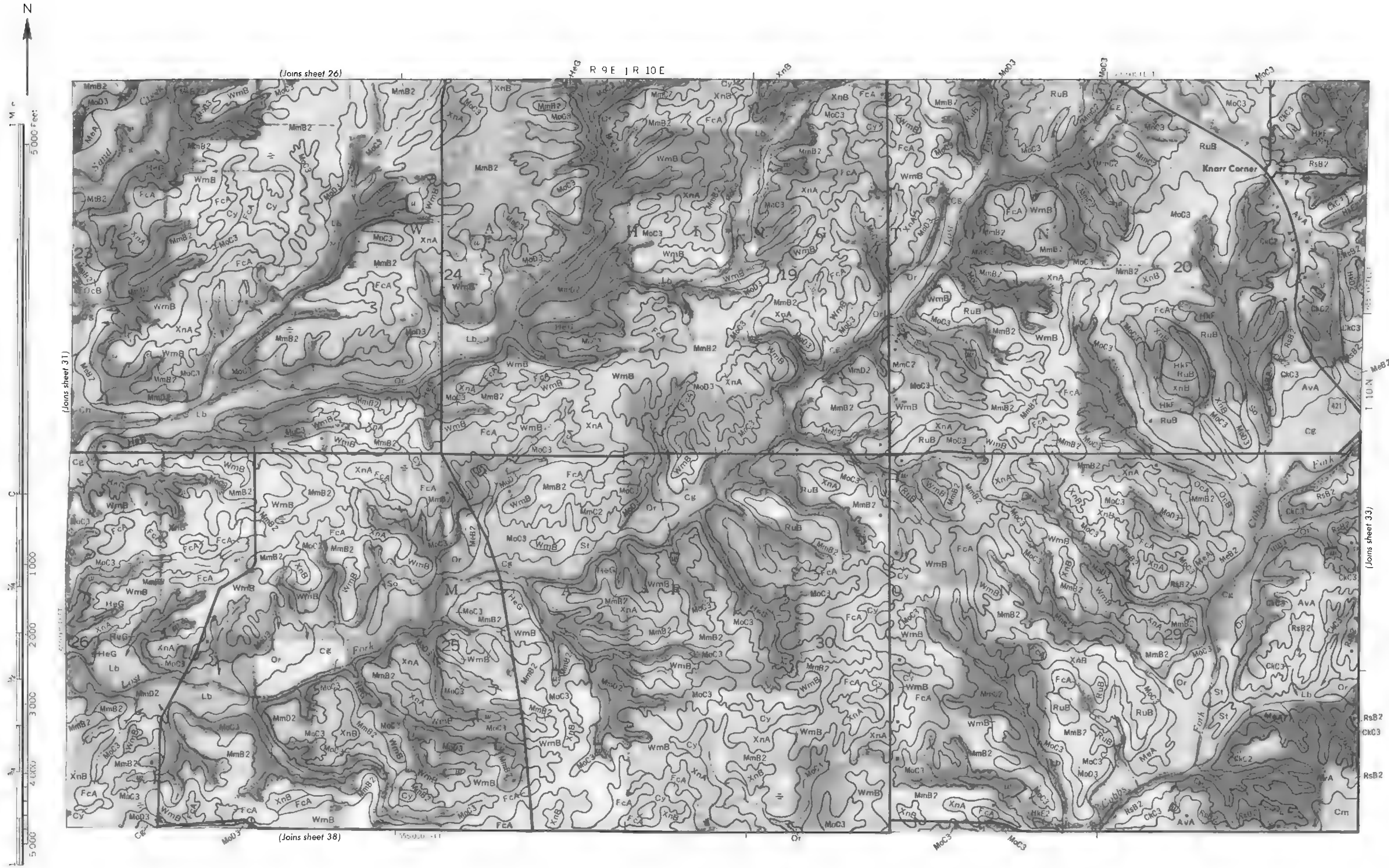

N
R. 10 E.
T. 10 N.
(Joins sheet 21)
(Joins sheet 26)
(Joins sheet 28)
(Joins sheet 33)
Mechanicsburg
Lake McCoy
McCoy
Smiths Crossing
Middle Branch
S A L T C R E E K
1 Mile
5 000 Feet

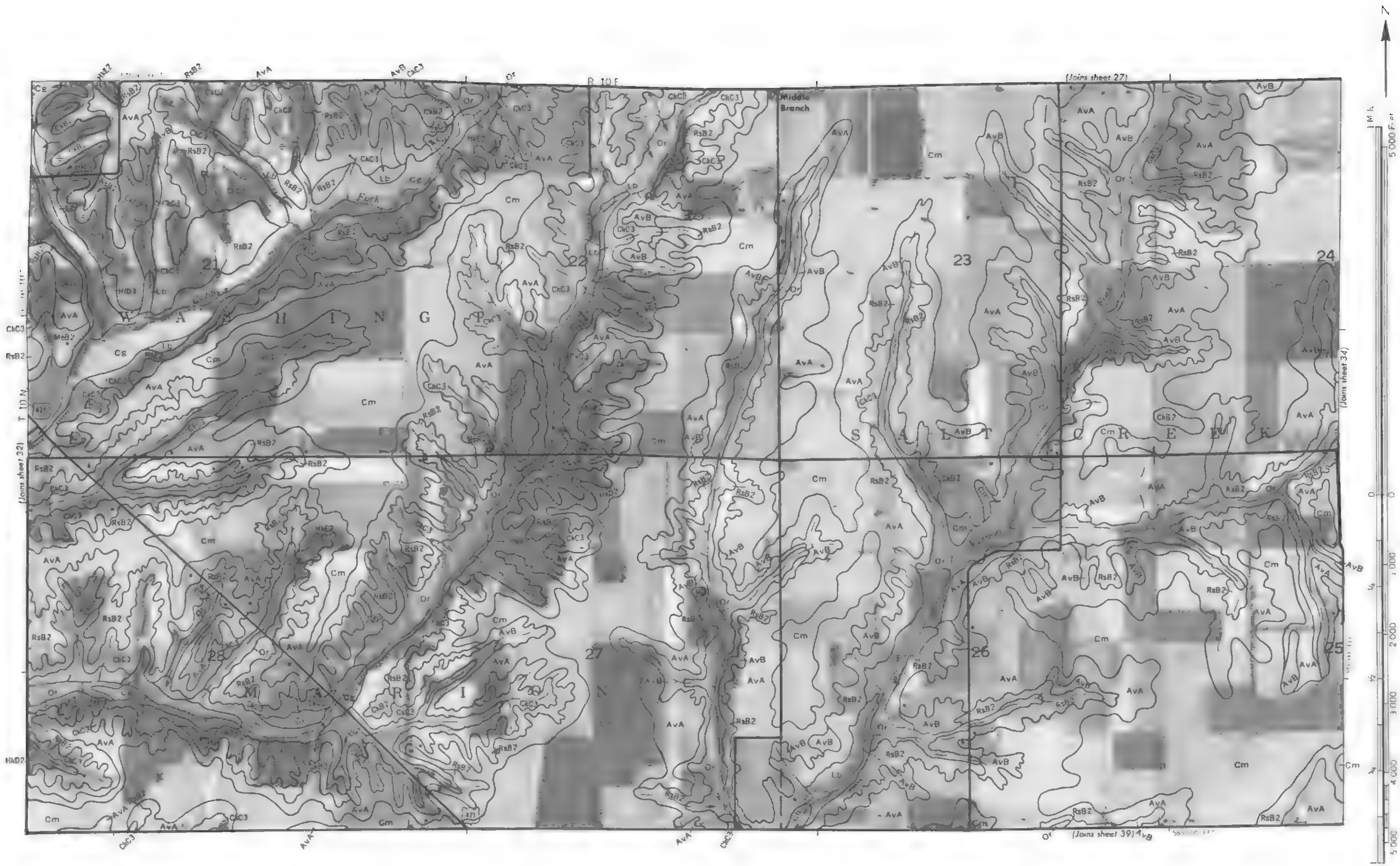

28
N
R 10 E | R 11 E
(Joins sheet 22)
(Joins sheet 27)
(Joins sheet 34)
12
7
8
13
18
17
16
Rossburg
New Point
Enochsburg
S A L T C R E E K
FRANKLIN COUNTY
1 Mile
5 000 Feet


29
N
R 8 E.
(Joins sheet 23)
(Joins sheet 30)
(Joins sheet 35)
T 10 N
BARTHOLOMEW COUNTY
C L A Y
19
20
21
22
30
29
28
27
1 Mile
5 000 Feet


N
(Joins sheet 24)
R 8 E | R 9 E
(Joins sheet 29)
(Joins sheet 37)
(Joins sheet 36)
T 10 N
22
23
24
19
27
26
25
30
5 000 Feet

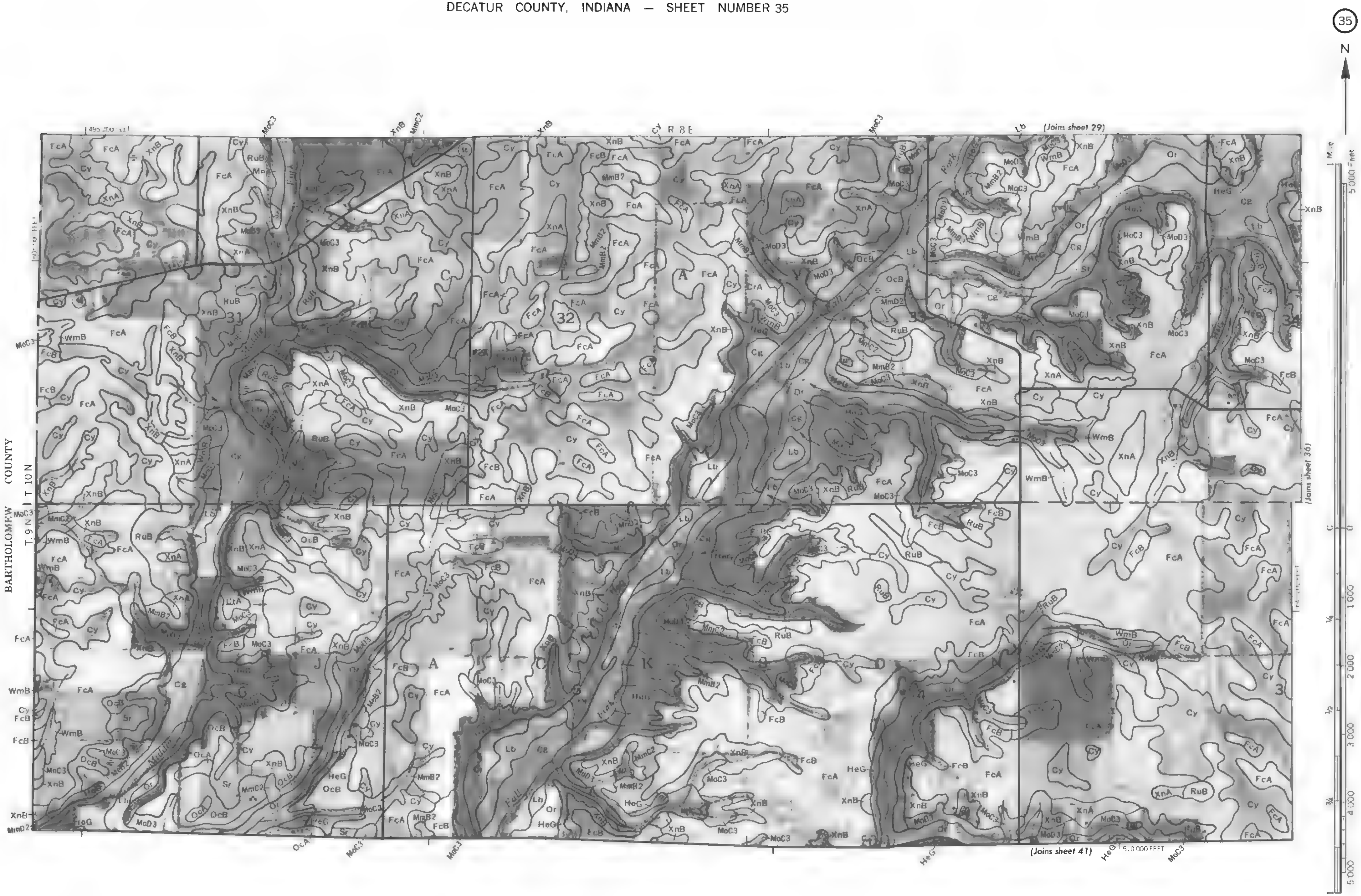

N
(Joins sheet 25)
(Joins sheet 30)
(Joins sheet 32)
(Joins sheet 37)
20
21
22
23
26
27
28
29
Hollis City
1 Mile
5 000 Feet


N
1 Mile
5 000 Feet
0
1 000
2 000
3 000
4 000
5 000
(Joins sheet 26)
R 9 E | R 10 E
(Joins sheet 31)
(Joins sheet 33)
(Joins sheet 38)
Knarr Corner
Sand Creek
Lost Fork
Fork
Clifty
Cobbs Fork
19
20
23
24
25
26
29
30
T 10 N
421
MmB2
MoC3
WmB
XnA
XnB
FcA
Cy
Lb
Or
Cg
HeG
RuB
RsB2
CkC3
HkF
AvA
St
So
MeA
MmD2
Cm



R. 10 E.
T. 10 N.
(Joins sheet 27)
(Joins sheet 34)
(Joins sheet 39)
(Joins sheet 32)
Middle Branch
WASHINGTON
SALT CREEK
MARION
21
22
23
24
25
26
27
28
1 Mile
5 000 Feet
N

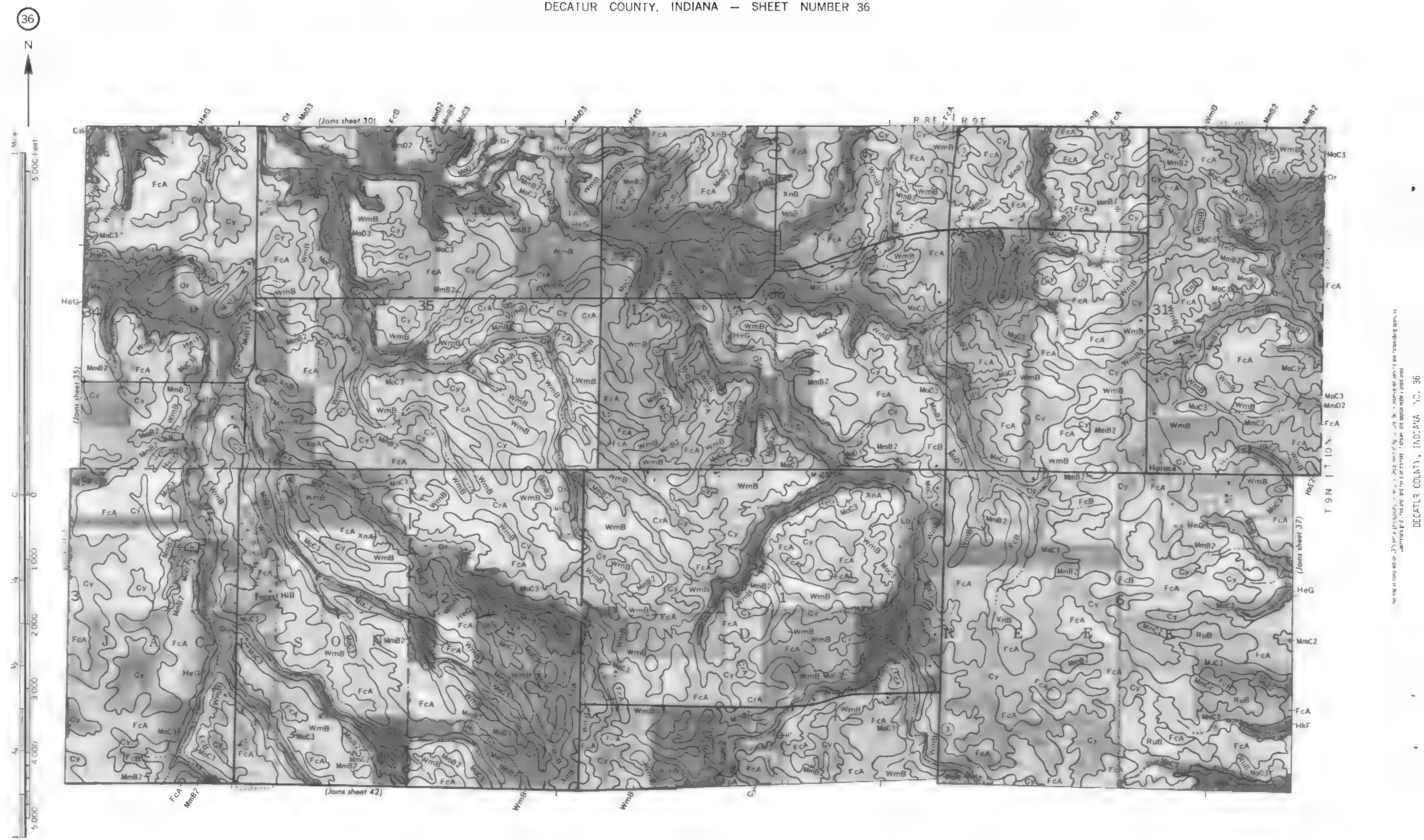
DECATUR COUNTY, INDIANA — SHEET NUMBER 34



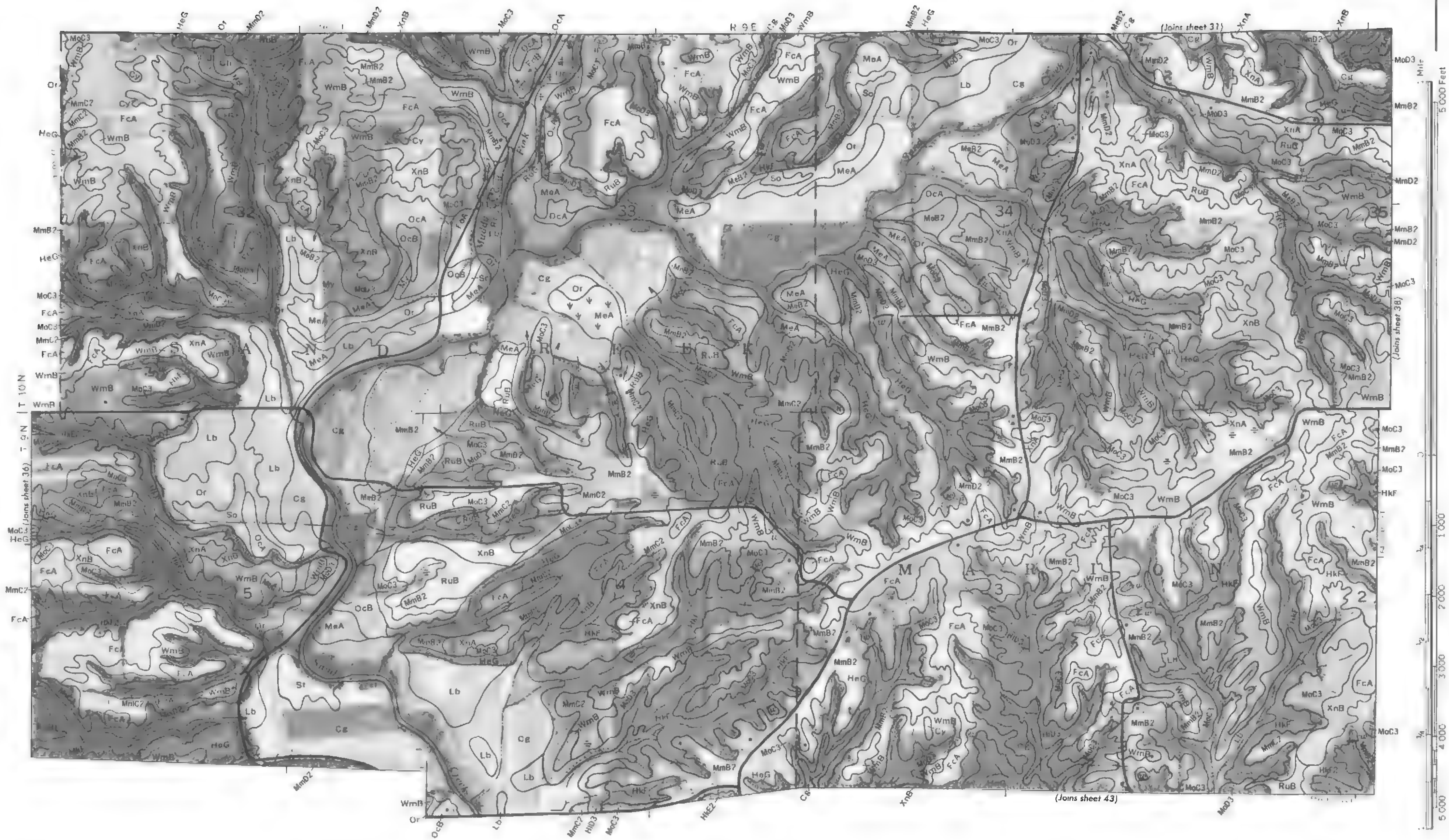
DECATUR COUNTY, INDIANA NO. 35

This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

DECATUR COUNTY, INDIANA — SHEET NUMBER 36

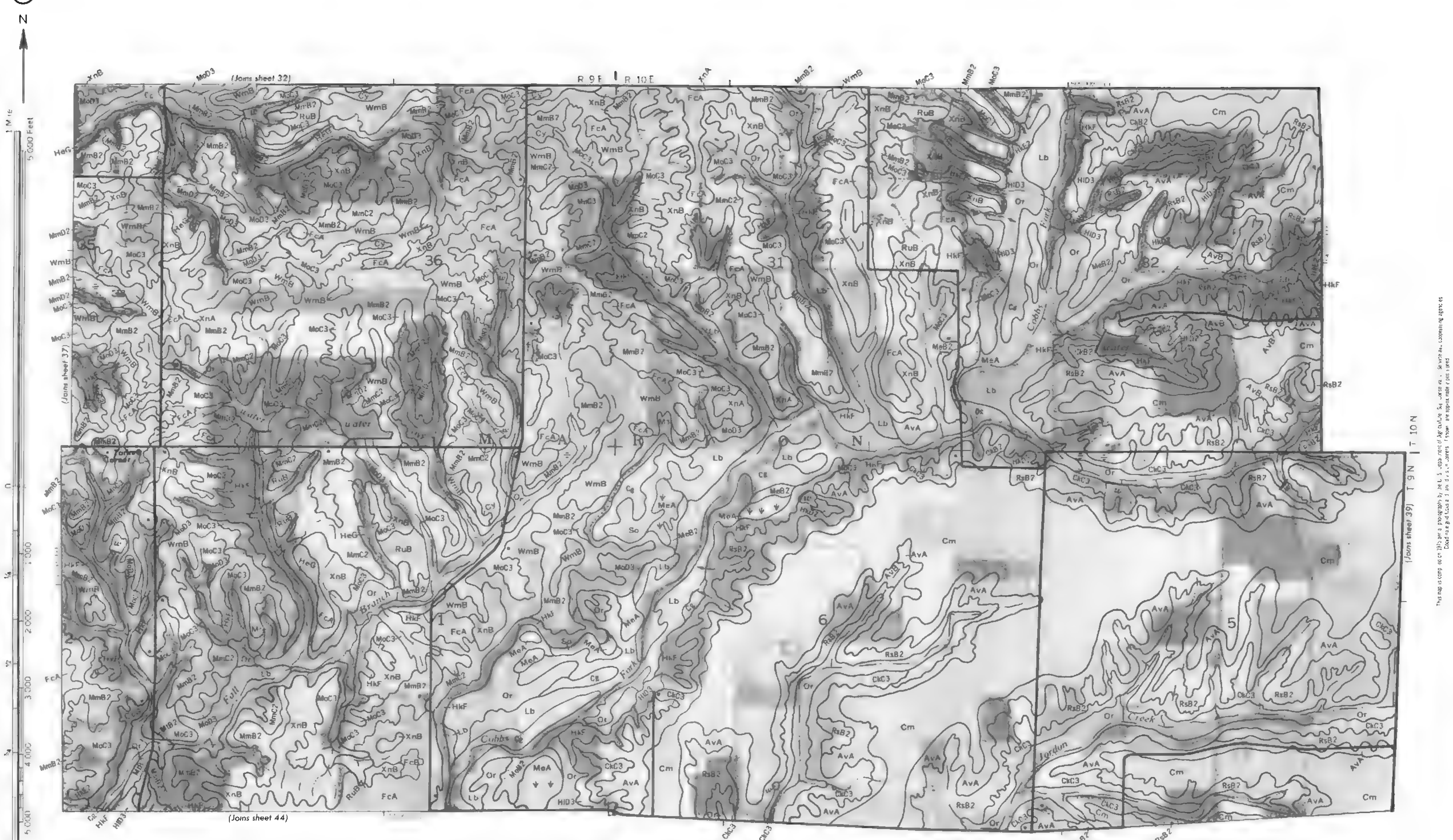


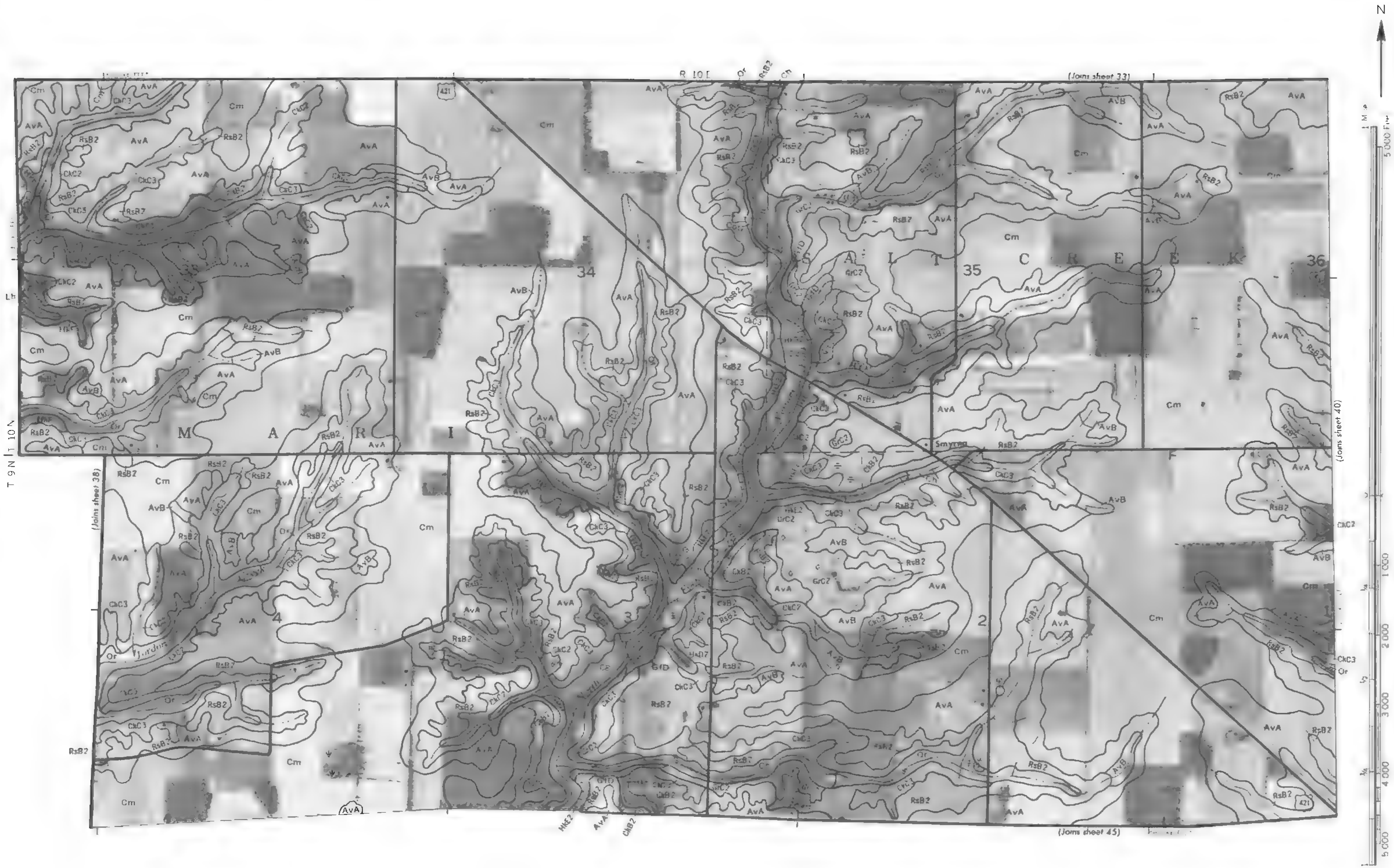
37

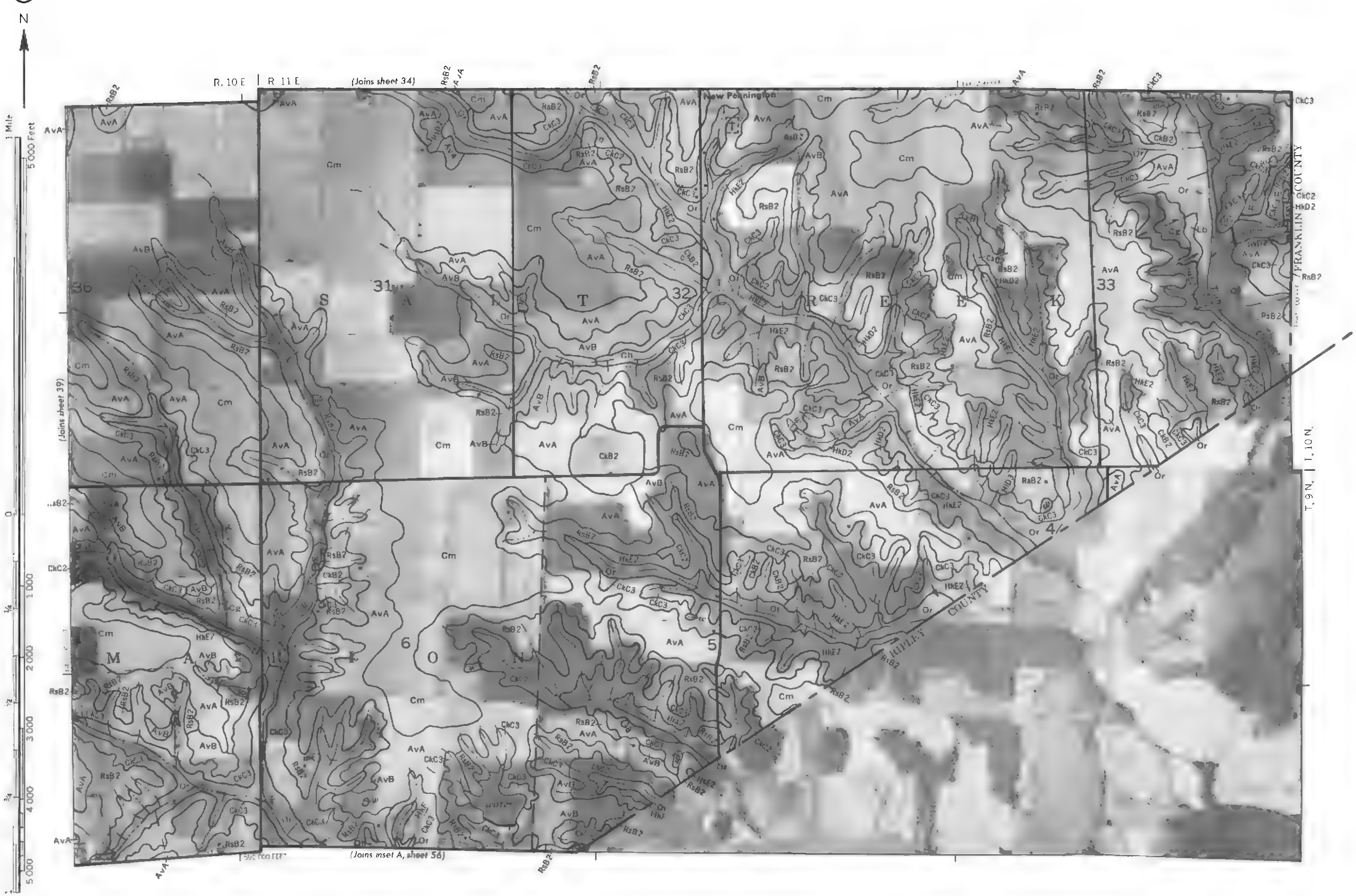


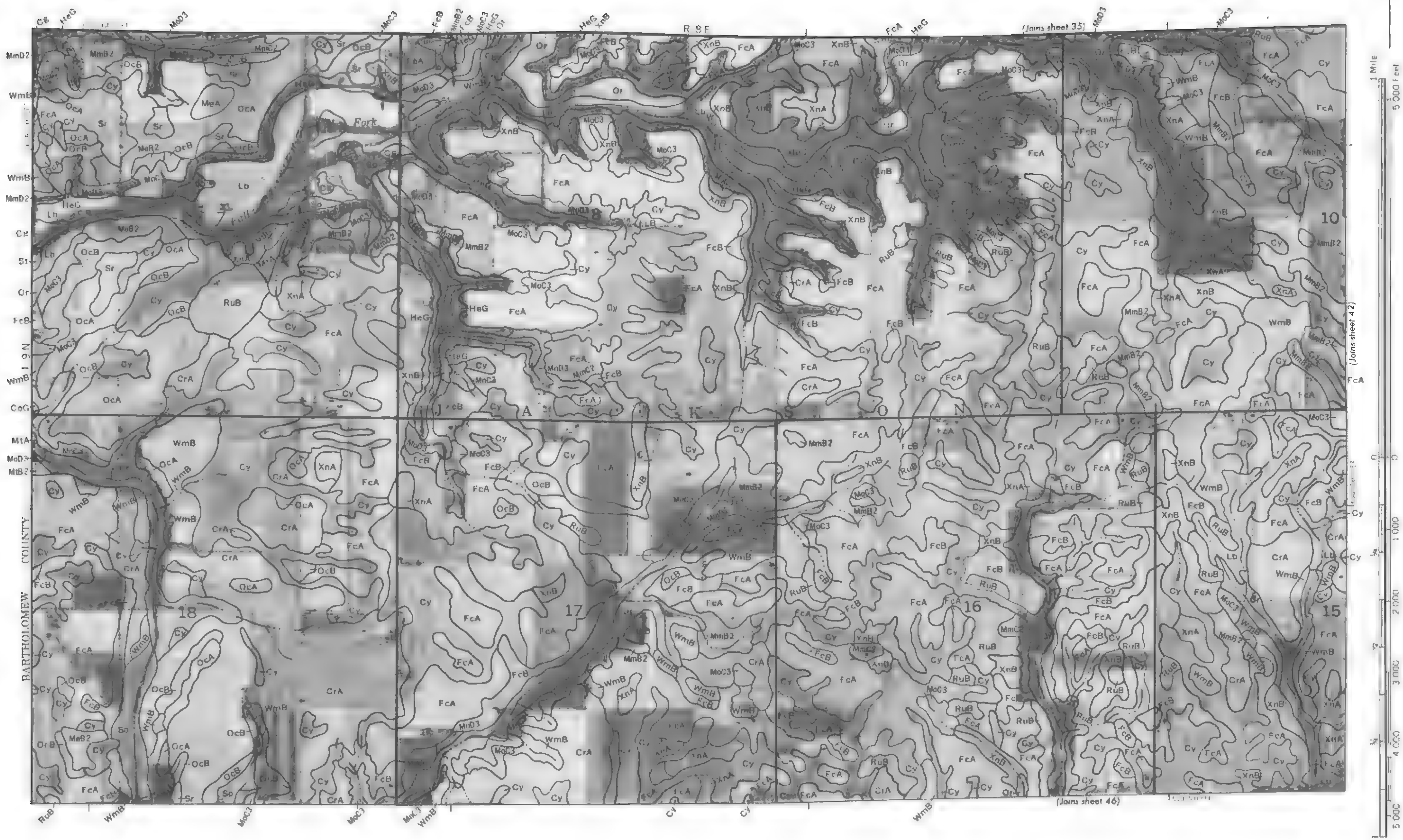
DECATUR COUNTY, INDIANA NO. 37

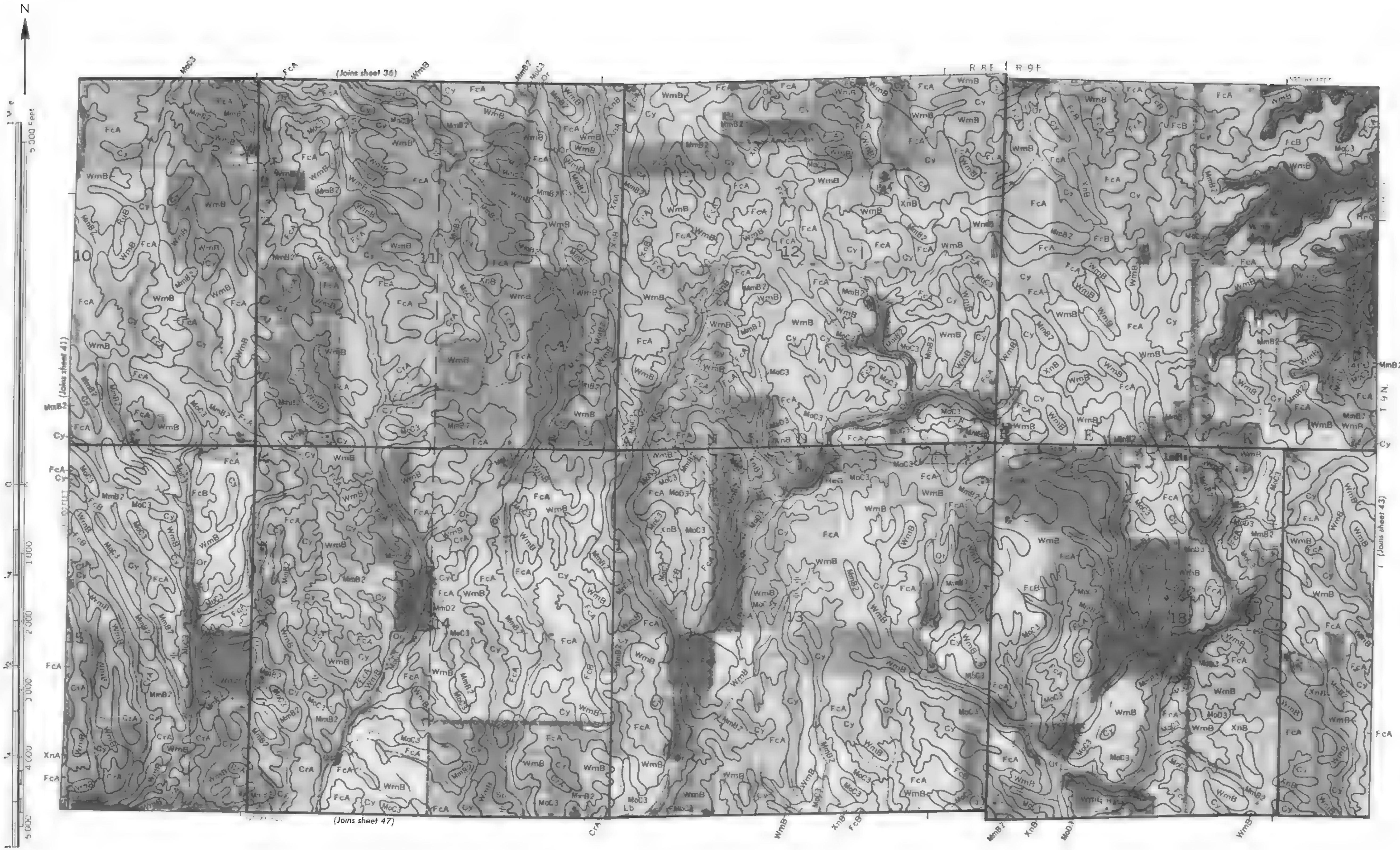
This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.


38
N
(Joins sheet 32)
(Joins sheet 37)
(Joins sheet 39)
(Joins sheet 44)
R 9 E
R 10 E
T 10 N
T 9 N
1 Mile
5 000 Feet
DECATUR COUNTY, INDIANA NO. 38


N
R 10 E
(Joins sheet 33)
(Joins sheet 38)
(Joins sheet 40)
(Joins sheet 45)
T 10 N
T 9 N
M A R I O N
S A L T C R E E K
34
35
36
4
3
2
Smyrna
421
Cm
AvA
AvB
RsB2
CkC2
CkC3
GrC2
Or


N
1 Mile
5 000 Feet
R. 10 E.
R. 11 E.
(Joins sheet 34)
(Joins sheet 39)
(Joins inset A, sheet 56)
New Pennington
FRANKLIN COUNTY
RIPLEY COUNTY
T. 10 N.
T. 9 N.
SALT CREEK
MARION
31
32
33
36
6
5
4


N
(Joins sheet 35)
(Joins sheet 42)
(Joins sheet 46)
R. 8 E.
T. 9 N.
BARTHOLOMEW COUNTY
J A C K S O N
8
10
15
16
17
18
1 Mile
5 000 Feet
0
1000
2000
3000
4000
5000



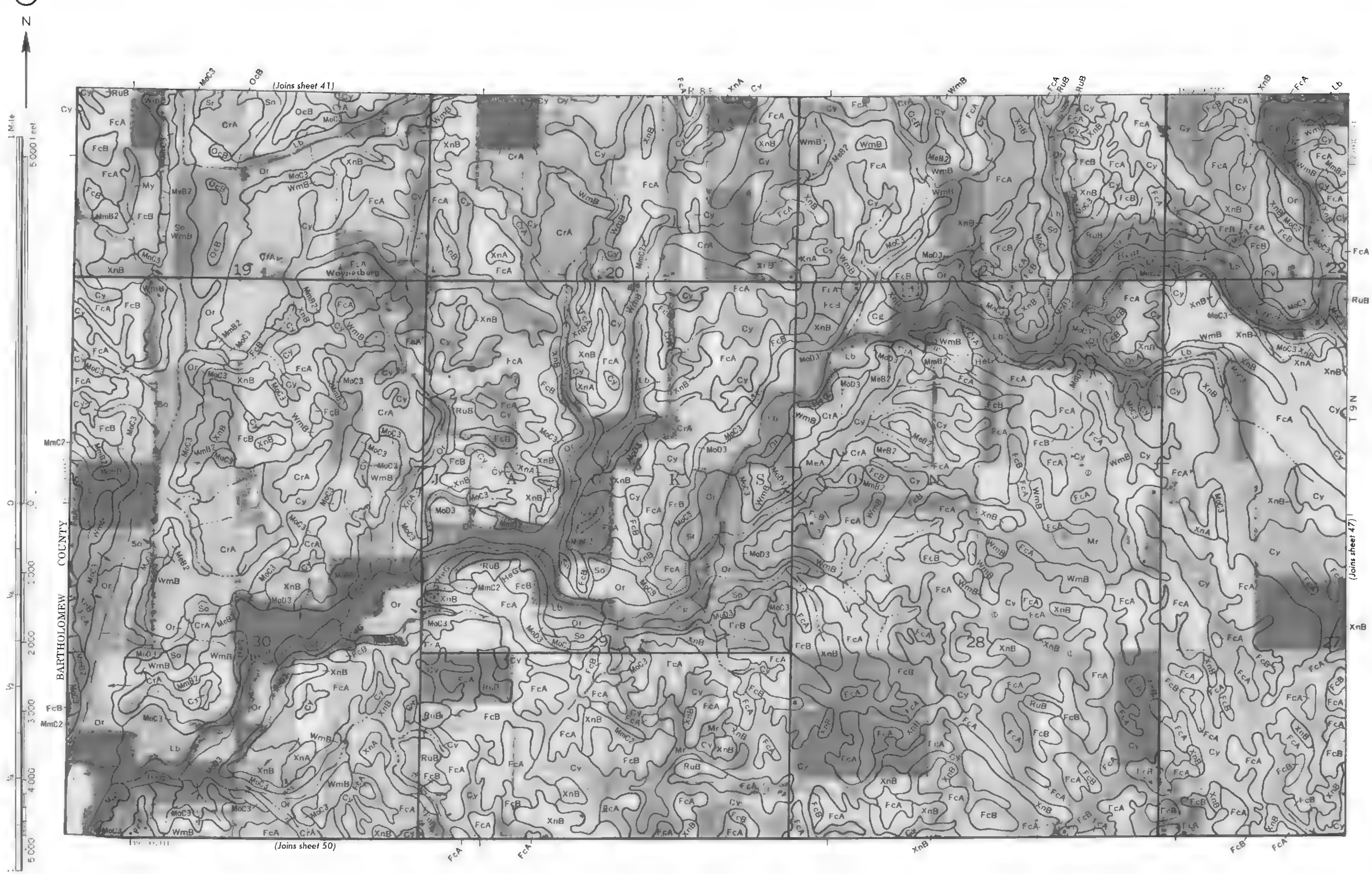
DECATUR COUNTY, INDIANA NO. 42


(Joins sheet 37)
(Joins sheet 48)
(Joins sheet 42)
(Joins sheet 44)
R. 9 E.
N
1 Mile
5000 Feet
16
15
14
Cobbs Fork
MoC3
HeG
WmB
MmB2
FcA
Cy
Cg
Lb
St
OcB
MeB2
XnB
HkE2
AvA
Cm
RsB2
CkC3
MnA
MtA
FoB
MeA

DECATUR COUNTY, INDIANA — SHEET NUMBER 44

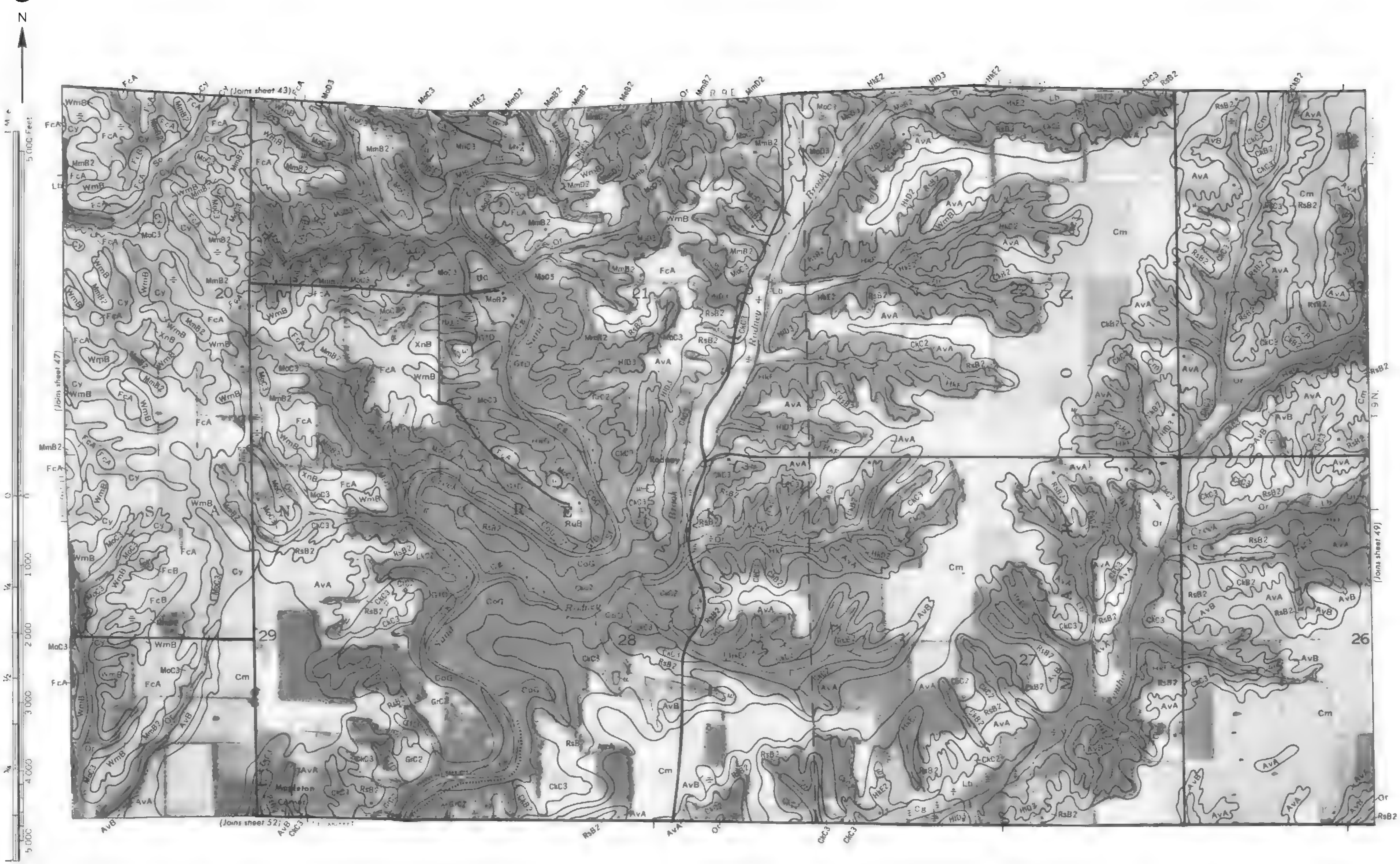

N
R 10 E
T 9 N
(Joins sheet 39)
(Joins inset A, sheet 56)
(Joins sheet 44)
(Joins inset A, sheet 53)
RIPLEY COUNTY
MARION
9
10
11
12
13
14
15
16
Cm
AvA
AvB
RsB2
CkC2
CkC3
GrC2
GfD
HkF
HtD3
CoG
Or
Lb
Ce

46



DECATUR COUNTY, INDIANA NO. 46


(Joins sheet 42)
(Joins sheet 46)
(Joins sheet 48)
(Joins sheet 51)
South Decatur High School
N
1 Mile
5 000 Feet
0
1 000
2 000
3 000
4 000
5 000



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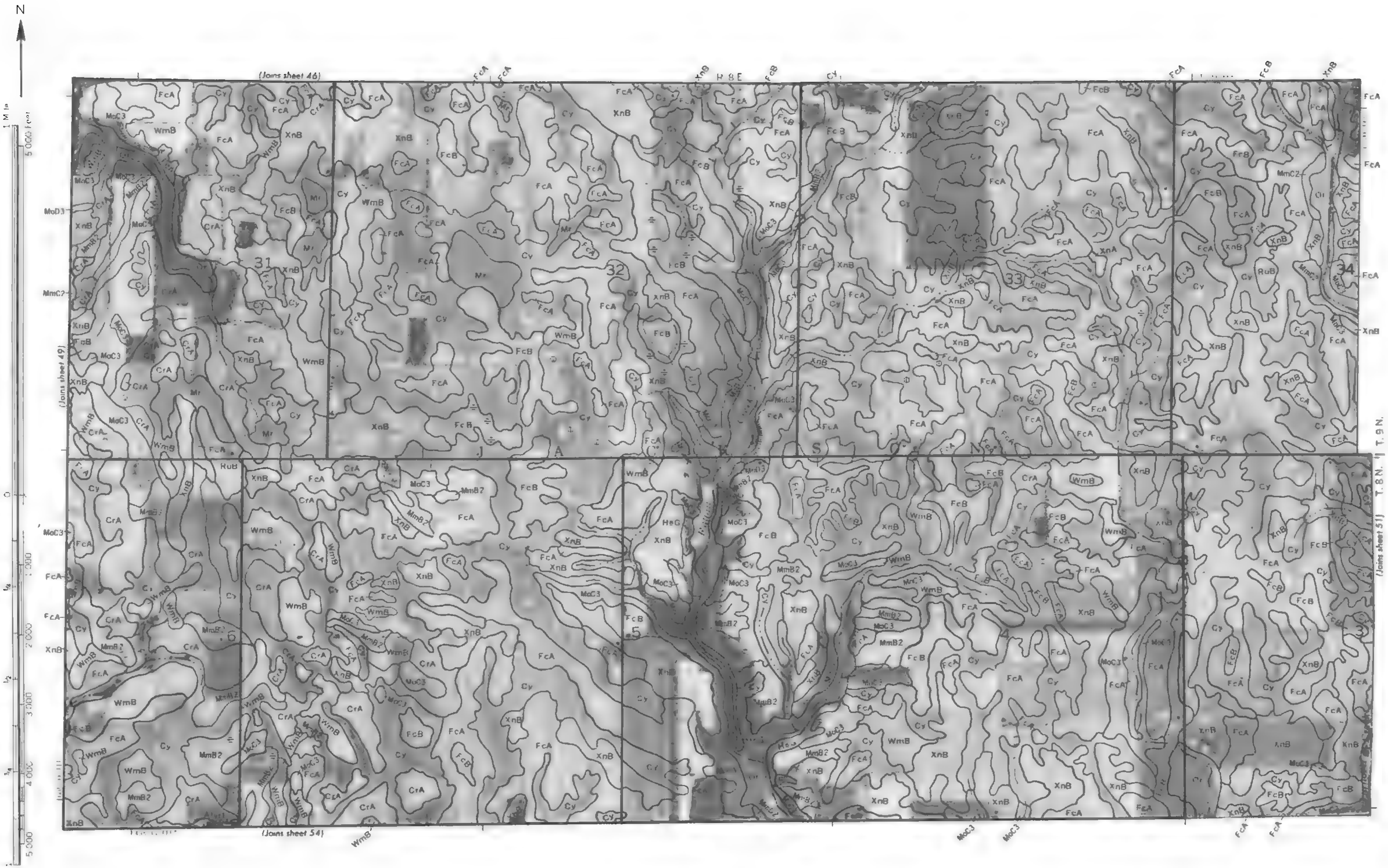
DECATUR COUNTY, INDIANA NO. 48


R.9E. | R.10E.
(Joins sheet 44)
(Joins sheet 48)
(Joins inset A, sheet 53)
(Joins sheet 53)
MARION
RIPLEY COUNTY
Millhousen
19
20
23
24
25
26
29
30
N
1 Mile
5000 Feet

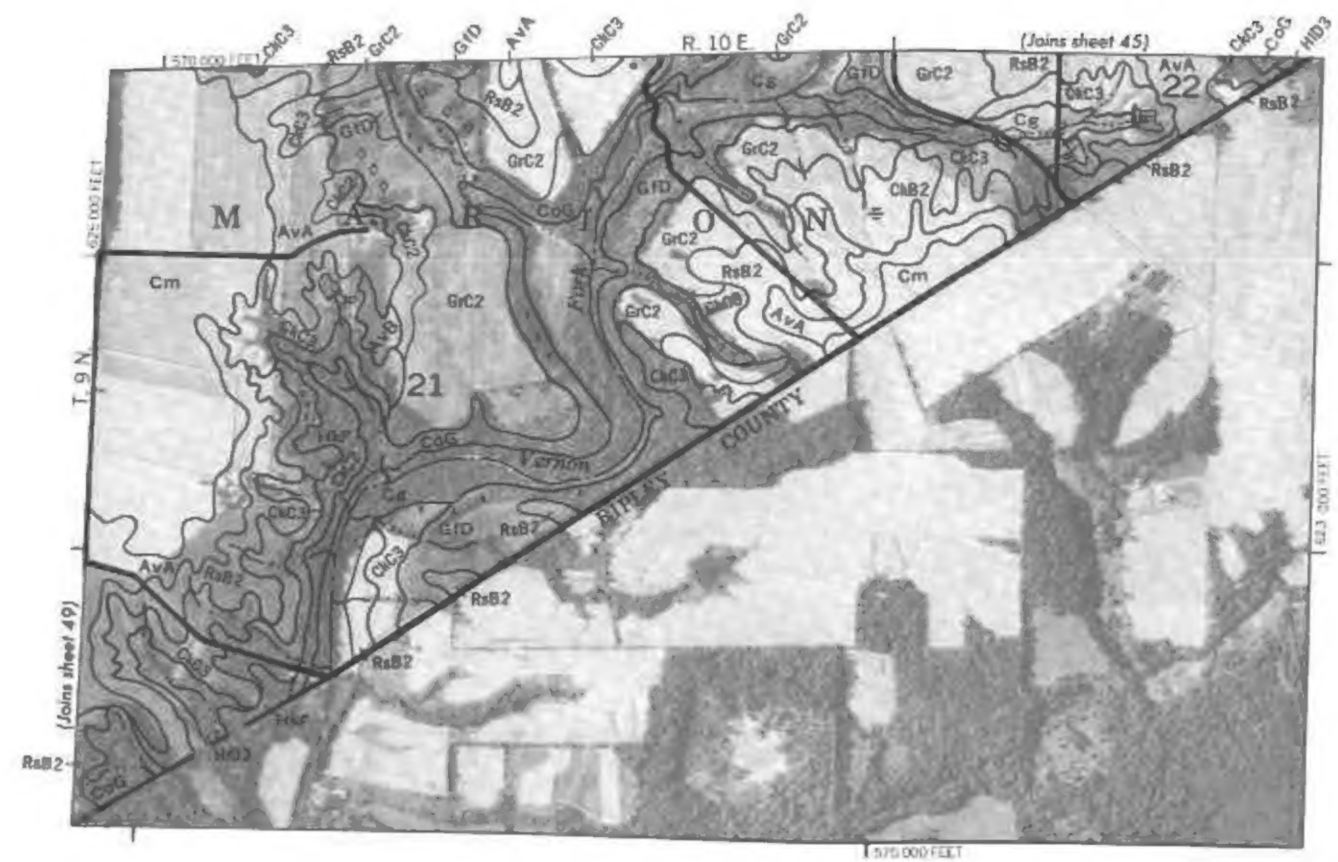

50
N
(Joins sheet 46)
(Joins sheet 49)
(Joins sheet 51)
(Joins sheet 54)
R 8 E
T. 9 N.
T. 8 N.
31
32
33
34
6
5
4
3
1 Mile
5 000 Feet
0
1 000
2 000
3 000
4 000
5 000


(Joins sheet 47)
(Joins sheet 52)
(Joins sheet 55)
(Joins sheet 50)
R 8 E
R 9 E
T 9 N
T 8 N
34
35
36
31
1
6
Westport
N
1 Mile
5 000 Feet


N
1 Mile
5 000 Feet
(Joins sheet 48)
(Joins sheet 51)
(Joins sheet 53)
(Joins sheet 56)
R 9 E
T 9 N
T 8 N
SAND CREEK
MARION
JENNINGS COUNTY
Neff Corner
32
33
34
35
2
3
4
5

53

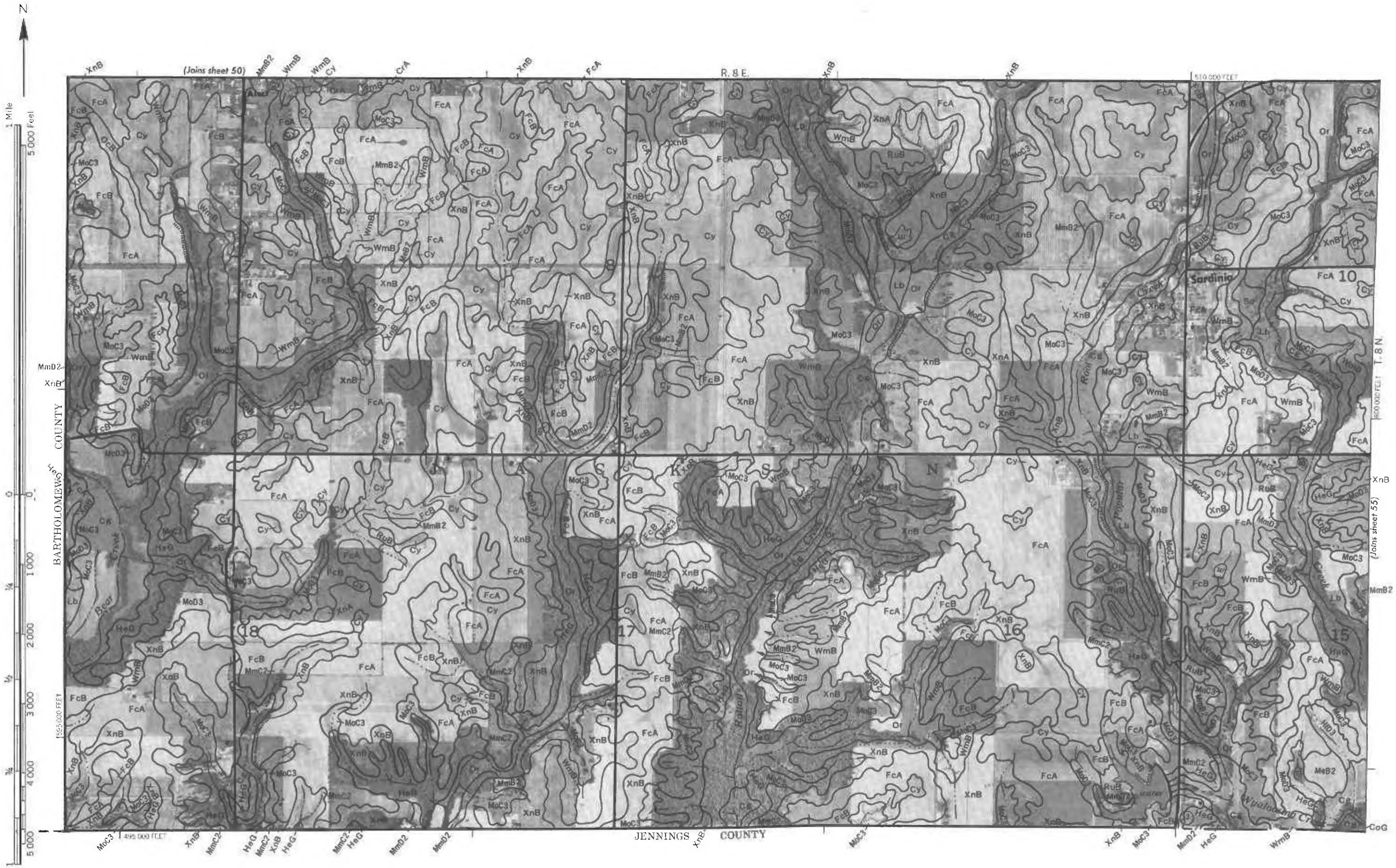
INSET A

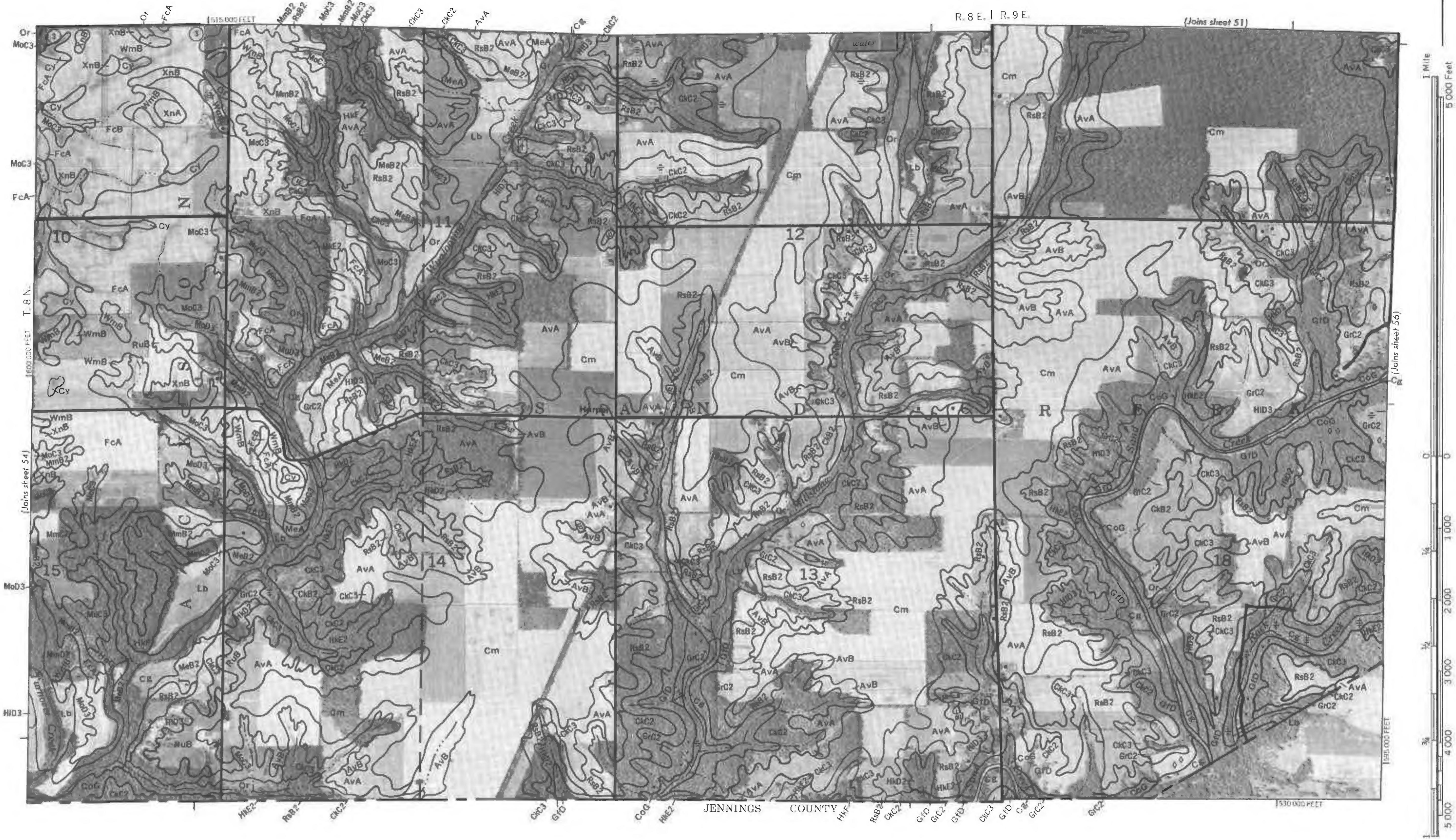


2000 AND 5000-FOOT GRID TICKS

DECATUR COUNTY, INDIANA NO. 53

This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.


54
N
(Joins sheet 50)
R. 8 E.
T. 8 N.
(Joins sheet 55)
BARTHOLOMEW COUNTY
JENNINGS COUNTY
Sardinia
1 Mile
5 000 Feet
0
1 000
2 000
3 000
4 000
5 000

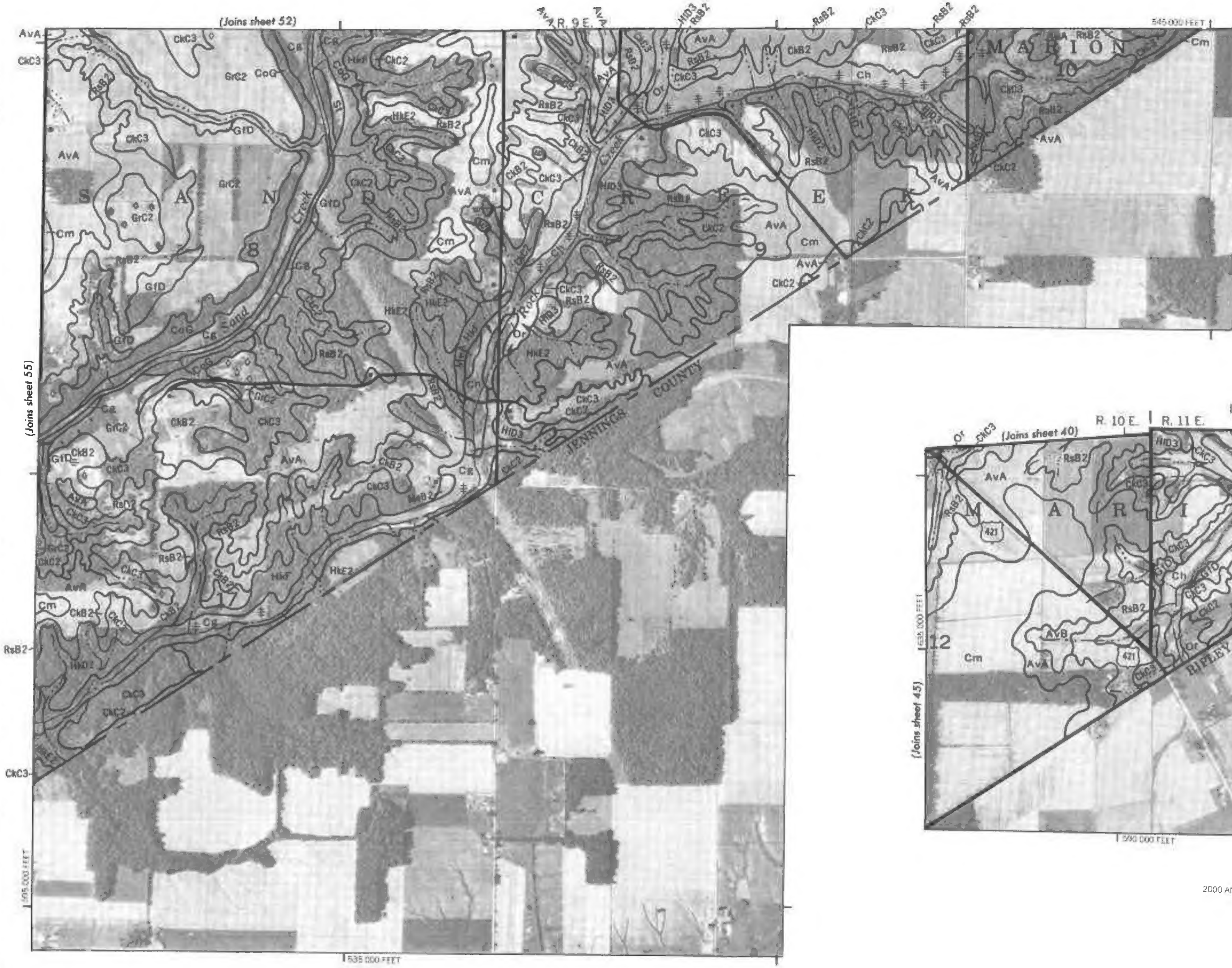


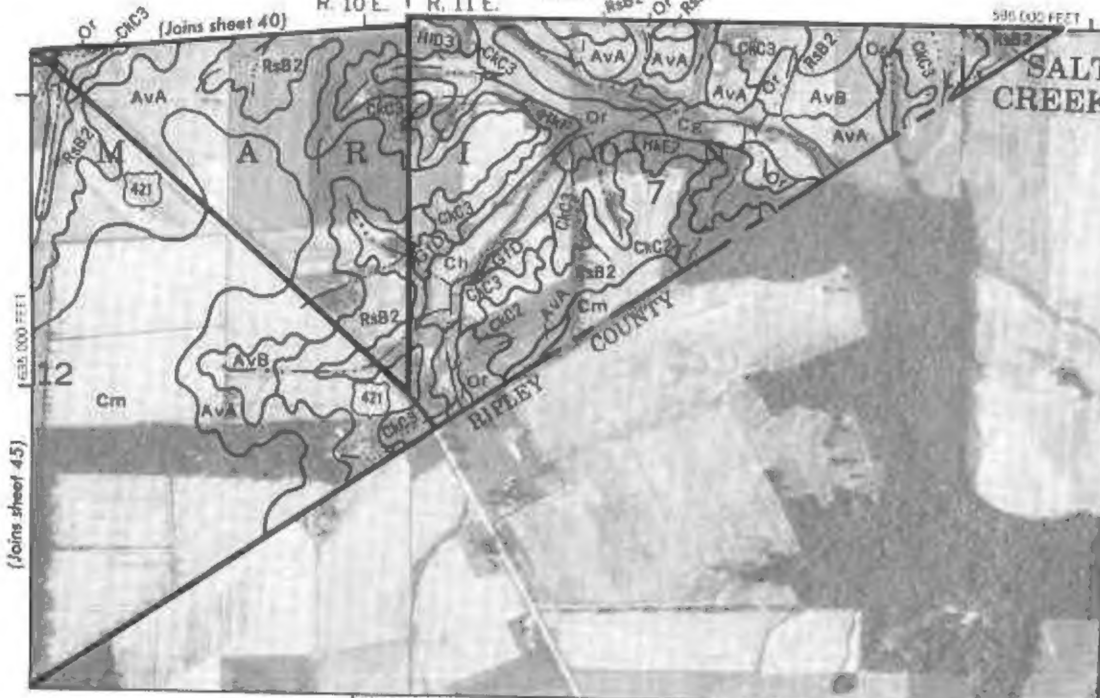
DECATUR COUNTY, INDIANA NO. 55

56

N

1 Mile
5 000 Feet
0 0
1 000
¼
2 000
½
3 000
¾
4 000
5 000





2000 AND 5000-FOOT GRID TICKS

This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

DECATUR COUNTY, INDIANA NO. 56